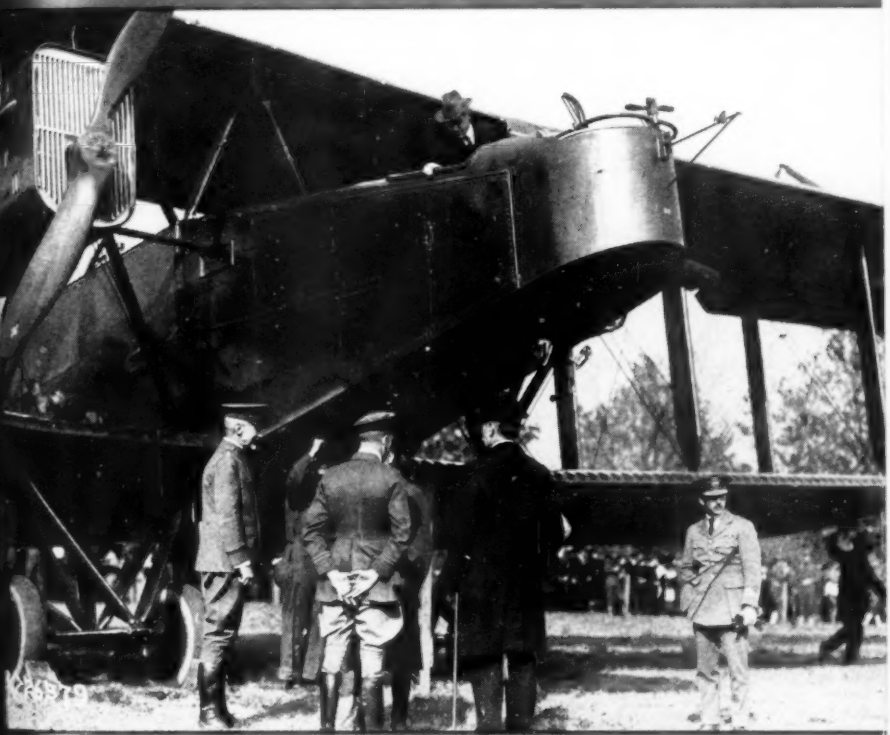
THE AIR POWER HISTORIAN



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...tary of War Newton D. Baker in the pilot's seat, General Peyton C. March on the ...t of the group, and John D. Ryan, Head of the Aircraft Production Board on the right, ...ecting a Handley-Page bombing plane on the Polo Field, Potomac Park, Washington, ...C., November 14th, 1918.

...LUME V • NUMBER 2 APRIL 1958

...E AIR FORCE HISTORICAL FOUNDATION

THE AIR FORCE HISTORICAL FOUNDATION

The Air Force Historical Foundation, established in 1953, is an independent, incorporated body, operating under the sanction of law as a nonprofit organization.

The Foundation is dedicated to the preservation, perpetuation and appropriate publication of the history and traditions of the United States Air Force and its predecessor organizations, and of the men whose lives have been devoted to that Service.

The business and objectives of the Foundation are educational and literary; to preserve the annals of American air power, especially the annals of the United States Air Force, its components, subsidiaries and affiliates, and of the individuals of whom they are composed; to disseminate to the public and to posterity accurate and complete historical information on air power subjects; and to preserve in a central repository significant materials depicting the history, culture, and traditions of the United States Air Force and the organizations which preceded it.

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HISTORY — CULTURE — TRADITION

THE AIR POWER HISTORIAN

VOLUME V • NUMBER 2 • APRIL 1958

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It is the policy of *The Air Power Historian* neither to endorse nor subscribe to the views expressed in the articles it presents. Many events in history must perforce remain controversial by reason of the multiplicity of interpretations given these events by those who participated in them, or have studied them from hindsight. Appropriate articles are invited for consideration.

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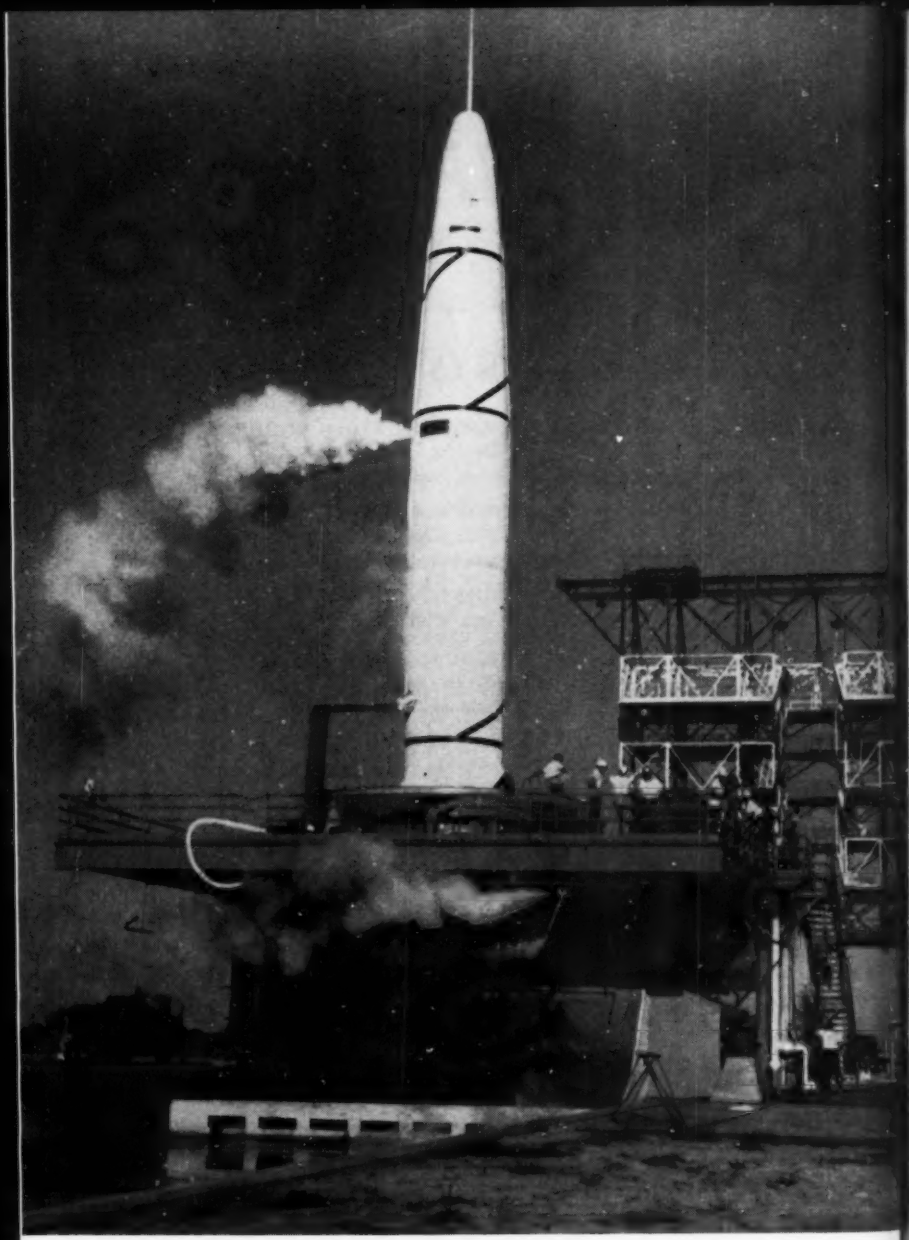


Credit: U.S. Air Force

An Air Force Thor, Intermediate Range Ballistic Missile, is readied for launching at the Air Force Missile Test Range, Cape Canaveral, Florida.

LEADERSHIP – *in the Conquest of Space*

By GENERAL THOMAS D. WHITE
Chief of Staff, U. S. Air Force

It is the policy of The Air Power Historian *to place outstanding contemporary documents upon the historical record. In the January issue, we printed the inaugural "space age" address of the Air Force Chief of Staff to the National Press Club in November 1957. General T. D. White made another noteworthy address to the cadets of the U. S. Air Force Academy on December 14, 1957. This timely and historic address is printed below for it otherwise would be unavailable to the many who were not within range of General White's voice.*

Tonight we are commemorating the first flight of the Wright Brothers which occurred 54 years ago next week. This year, the Air Force is also celebrating its 50th Anniversary.

As I look back over the years, the tremendous progress in aviation seems beyond belief. I first soloed 33 years ago in a Jenny — official designation, JN-4D. This was a two place biplane which weighed 1920 lbs. (two pilots included). It had a top speed of 75 mph, stalled at 45 mph and carried 21 gallons of fuel. It could climb to 2000 feet in 10 minutes — provided its "high-powered" engine worked perfectly and revved up to its full 90 H.P. The Jenny had no flaps, no brakes and practically no instruments. *It was quite a bird!*

It is amusing to look back at aircraft we once thought were first rate and compare them to what we consider first rate today. I'm willing to wager that in a few years you men will look back at what we had in 1957 with the same tolerant amusement.

Looking backwards, however, is not an Air Force habit. Looking forward is! I am sure that the Wright Brothers and men like Dr. Langley, General Lahm, General Arnold, and General Vandenberg would not mind if tonight I discuss the future rather than the past. They would be the first to agree that Americans must look to the future — not just to the glory of the past.

Tonight, I want to look forward with you into the Air Force of the future — your future.

AIR AND SPACE

The current interest in ballistic missiles, sputniks and the possibilities of weekend cross-countries to the moon has excited the imagination and curiosity of young men all over the world. This interest has also resulted in many statements, pro and con, concerning

whether or not pilots will still be required. Krushchev is reported to have said that because of the sputnik, manned aircraft must be relegated to museums.

In a way, Krushchev had a point. Latest reports to my office in the Pentagon indicate that the Wright Brother's original aircraft is no longer flying. I can also add that the last time I was in the Smithsonian Institution, I saw Lindbergh's famous "Spirit of St. Louis" hanging from the ceiling. Some day, and it may not be too far away, the aircraft we are using today will also be relegated to museums . . . as will the *first* relics recovered from *outer space*.

But the day you stroll into a museum to see a B-52 or one of the Century Series fighters, it will not be because man has been eliminated as a direct participant. It will be because new equipment has been perfected to propel him higher, drive him faster, keep him in motion longer, and so enable him to perform more tasks better. The missiles that are getting the headlines today are but one step in the evolution from aircraft to piloted spacecraft.

* * *

The Air Force is planning and working rapidly into the future . . . and in the future I see indefinitely . . . integrated forces of manned and unmanned systems. It will take both manned and unmanned systems because the Air Force goal must continue to be . . . economical and *effective* performance of its missions. If unmanned systems can perform a mission effectively without risking the lives of a combat crew, then we will use unmanned systems. If manned systems can do the job better, then we will use manned systems.

* * *

For many years, airmen have known that the capability to control the air permits control of the land and seas beneath. We airmen also feel that the capability to control space will be the basic essential to control of the surface of the earth.

In speaking of the control of the air and the control of space, I want to stress that there is no fine dividing line between air and space. Air and space are an indivisible field of operations.

No one can tell you where air ends and space begins, but the scientists do know that the great majority, over 99%, of the earth's atmosphere lies within 20 miles of the surface of the earth. It is quite obvious that we cannot control the air up to 20 miles above the earth's surface and relinquish control of space above that altitude . . . and still survive.

OUR PROGRESS TOWARDS SPACE FLIGHT

The progress in the field of aeronautics and astronautics has been so astounding and so rapid during the last few years that one sometimes forgets that man first envisioned flight many hundreds of years ago.

The known chronology of aviation started with Leonardo da Vinci who, before devoting his extraordinary creative genius to serious painting, was a proficient mechanical engineer. Almost 500 years ago, in 1483, he conducted extensive research concerning the science of flying. The phrase "There shall be wings," is a quotation from da Vinci.

It took 300 years from da Vinci's time before a Frenchman by the name of Jean de Rozier made the first balloon flight in 1783. It was another 120 years before the Wright Brothers made their first successful aircraft flight. It took 10 more years before man had nerve enough to fly upside down. Adolph Pegoud, another

Frenchman, performed this feat in 1913.

* * *

World Wars I and II showed us that men with imagination, courage and skill could perform incredible feats in the sky. Names like Immelmann, Lufberry, Rickenbacker, Spaatz and Doolittle will be remembered long after the aircraft they flew have been forgotten.

Recent progress in the jet era and on the borders of space tend to overshadow the brave men before us who opened the door to the era we are now approaching. Those men who preceded us, however, performed feats which, *for their day,* were even more astounding than are some of the things that are happening today. They were leaders in the true meaning of the word.

* * *

The Air Force can be very proud of the men who more recently have shown the way toward true conquest of space.

I imagine you all have heard of Colonel Stapp who is known as the fastest man on earth; the man who has been working with the rocket sled to test the effects of high G forces upon man's physical being. It is no secret that Colonel Stapp has successfully withstood a force of 25 G's.

Major David G. Simons, who recently set the world's altitude record for manned balloon flight when he flew to an altitude of 102 thousand feet, also remained above 70,000 feet for 26 hours.

The Bell X-2, a rocket research plane, carried Captain Kincheloe up to approximately 25 miles above the earth at 1900 miles per hour.

These experiments obviously were not conducted just to see how much a man could take, but to give us a basis for further planning on the type of equipment that is required for successful piloted space flight.

The X-15, which is now in the works, is designed for speeds and altitudes much greater than those of the X-2. I think it is interesting to point out that in the development of this spacecraft, which is a joint effort on the part of the Air Force, the Navy and the NACA, the airframe, the powerplant, the cockpit, and the pilot all compose an integrated system designed specifically for the mission.

The next step is the Air Force program to fly at hypersonic speeds, circumventing the globe many times before re-entry into the earth's atmosphere. As a weapon system, this program will represent the first major breakthrough in sustained piloted space flight. With this system we will resolve the many problems necessary to place man either on a continuous orbit around the earth or send him soaring into outer space to nearby planets.

At the rate things are going, I feel sure that manned space flight will become routine in a very few years. The current technological race is producing technical advances at an unprecedented rate. Engine thrust has been increased many times over what was considered excellent a few years ago; and personal equipment has been improved to a point where we know it will be adequate for manned space flight to the moon.

I feel sure that what many men used to think of as Buck Roger's creations — will be as natural to you men in the next few years as are the fast jet flights that today are considered routine operations.

WHY YOU ARE HERE

I have long felt that in an era of rapid technological progress, we sometimes forget that something else than

hardware and technical skill is needed to accomplish our missions.

The other thing which I feel is of utmost importance to the Air Force is . . . *LEADERSHIP*. I am convinced that if the United States Air Force of the future is to control space, the United States Air Force of the future will need leaders in space.

Leadership means many things to many men. I cannot tell you how to become a good leader — that is something you have to find out for yourselves. There is no positive check list to follow — but you must have the desire.

* * *

General Freiherr von Hammerstein-Equord who was the former head of the German War Department, Chief of Army Direction said:

"I divide my officers into four classes as follows: The clever, the industrious, the lazy, and the stupid. *Each officer always possessses two of these qualities*. Those who are clever and industrious I appoint to the general staff. The man who is clever and lazy is destined for high command because he has the nerve to deal with all situations. Use can, under certain circumstances, be made of those who are stupid and lazy. But whoever is stupid and industrious must be got rid of at once."

I have always considered General von Hammerstein's observations very interesting; particularly so, when one attempts to analyze the four categories he listed.

It is quite clear to me why General von Hammerstein wanted clever and industrious officers on his staff. Such men are particularly needed today. Men with imagination and the power to comprehend the esential nature of problems or situations, and who are not afraid to work, are extremely valuable to a commander.

But, what did von Hammerstein mean when he said the clever and lazy man qualified for the highest leadership posts? The cleverness attribute we needn't discuss except to point out that he meant brains and experience — experience because no man would be in a position to be considered for high command had he not already gained considerable experience.

To me the General used the word "lazy," however, in a wholly unusual context. The General didn't mean lazy in the true sense. He meant, without a doubt, the ability to distinguish between the really vital and the less consequential; he meant the attribute of being able to grasp the essentials and to refuse to be cluttered up with the non-essentials. Once the man with such attributes has charted his course based on vital essentials, he delegates the rest to subordinates — subordinates whom he has selected, whom he trusts and in whom he can repose confidence. These men do the "work" so the high commander can perform the major tasks. Then this clever and so-termed "lazy" commander accepts full responsibility for his actions. The major decisions are his alone and he accepts the consequences as worked out in detail by competent subordinates. That's what von Hammerstein meant by the "nerve" to deal with all situations.

It is also true that the stupid and lazy man can be used under certain circumstances, but in this day and age I feel there will seldom be an occasion to use him. Years ago, when things were less complex and time was not so pressing, men who moved and thought slowly had more opportunity to be of value. They could perform those tasks which required little or no imagination and which could be accom-

plished "by the book" now or later. Old time orderlies, stable and supply sergeants and "regulation happy" adjutants were sometimes examples of this type of man.

I wholeheartedly concur with von Hammerstein that the stupid and industrious individual is too dangerous to keep. The industriously stupid man can get you into trouble. He can do too many things wrong, make too many wrong decisions and create too much confusion. Correcting his mistakes, requires too much time and effort. You are much better off without him.

Regardless of whether you or I agree with General von Hammerstein in all his points, I think we must agree that "brains" are needed. The "brainy" man is the only type that is endowed with the peculiar problem solving capacity which is so urgently required. He is the only type that can hope to deal effectively with new problems not adequately provided for by stereotyped reactions. He is also the only type that can hope to deal effectively with problems whose elements are highly uncertain or largely unknown.

Today, more than ever before we need "brains." Some men may refer to this factor as "intelligence" or as being "clever." Whatever you call it, we need men who can think . . . and who can think well.

In addition to the ability to think . . . or the possession of "brains," there are some other characteristics which tend to round out the good officer and the good leader. A good leader must also have determination, the ability to express himself, intellectual discipline, unfailing precision and reliability, ideals and a steady unshakeable confidence in himself.

* * *

Summarizing the ideal leader, the famous military philosopher, Clausewitz said:

> "When we must in war entrust the safety of our brothers and children and the honor and safety of our country to some leader, we prefer to find the critical rather than the creative intellect, the broad rather than the narrow mind, the cool rather than the hot head."

Needless to say, finding such a man is sometimes a difficult task. But I feel that here at this great Air Force Academy we will discover a high percentage of such men. The selection process, the curriculum and the discipline taught here provide the basic material for leadership.

CONCLUSION

Gentlemen, I have enjoyed being here with you today for two reasons: *First of all,* it is inspiring to me to talk to the men who will lead the Air Force of the future — and you are some of those men. I trust you consider this a challenge!

The second reason is that it has given me this opportunity to discuss the space age. Men like you who will travel in space, who will control space, will be among the men upon whom will depend the future and security of the free world. To paraphrase Sir Winston Churchill — never before has such a responsibility been at the mercy of so few. . . .

Knowledge Is Power

"The science of today is the technology of tomorrow. Many people are afraid we will be attacked by Russia. I am not free of such worry. But I do not think that this is the most probable way in which they will defeat us. They will advance so fast in science and leave us so far behind that their way of doing things will be *the* way, and there will be nothing we can do about it.

— Dr. Edward Teller, as quoted in *Time*, Nov. 18, 1957, p. 21.

TRADITIONALISM IS A DEADLY DANGER

By the late GENERAL MUIR S. FAIRCHILD, USAF

Since sputniks *have animated great public and official concern in the uneasy late fall of 1957, it seemed a timely occasion to recall to mind a basic Air Force statement on military education and creative thinking. Below is the substance of a classic address by the first Commanding General of the Air University. It was the welcoming address given by Major General Muir S. Fairchild to the first classes of the Air War College and the Air Command and Staff School, delivered on 3 September 1946. Since it had never been published the editors felt that pertinent excerpts should be placed upon the historical record in the pages of* The Air Power Historian. *It has been and will often be quoted. And, its basic thesis can well be reexamined in the perspective of today and in the inevitably difficult tomorrow for those who would have this nation survive and prosper.*

The death of General "Sandy" Fairchild on 17 March 1950, while he was serving as Vice Chief of Staff of the U. S. Air Force, was a great loss to the nation and the military profession. It has been generally recognized that because of his great integrity, nervous energy, and intellectual drive, "Sandy" Fairchild killed himself in the harness, leading his fellow airmen and other military colleagues.

General Fairchild was born on 2 September, 1894, at Bellingham, Washington. In 1916 he was a Sergeant 1st Class with the Washington National Guard, a rank he received in the Mexican border skirmish of that year. Later he trained as a Flying Cadet at Berkeley, California, and received a commission as a 2d Lt. in the Signal Corps Reserve in 1918. He became a 1st Lt. in the Regular Air Service on 1 July 1920. He endured the hardships of demobilization and the lean years of the early '20s, then in 1927 flew in the Pan-American Good Will Flight for which he received the Distinguished Flying Cross. He attended the Army Industrial College, Air Tactical School and the Army War College. For several years he remained on the faculty of the Air Tactical School.

In 1941, Fairchild was made first Secretary of Air Staff, receiving a promotion to Brigadier General; later he was Assistant Chief of Air Corps in August 1941. In March 1942, he was appointed Director of Military Requirements, Headquarters AAF, and in November of that year he joined the Combined Chiefs of Staff. He remained in this post throughout the war as a member of the Joint Strategic Survey Committee. Immediately following the war he was made the first Commanding General of the Air University. In 1948 he was recalled to Washington by General Vandenberg to be Vice Chief of Staff of the new USAF. In addition to the DFC, General Fairchield held the Legion of Merit and the Distinguished Service Medal. He died of a heart attack at Ft. McNair, Washington, D. C.

Here at Maxwell Field, six years ago, in June of 1940, it fell to my lot to make the closing address terminating the existence of the old Air Corps Tactical School. On that occasion I expressed the hope that, when the old emergency which required its closing was past, the School might once more be reopened to continue its important work on a finer and larger scale.

Today, over six years later, that expressed hope is at last realized. It is a great pleasure and privilege to participate today as we open the Air University here at the site of the old Air Corps Tactical School.

In some respects the Air University is the direct descendant of that old Air Corps Tactical School. However, those of us who have been privileged to assist in this new development feel that the relationship is nevertheless quite remote. Here in the Air University has been created a system of schools such as we could only dream about in the old days six years ago.

Much has occurred during those intervening six years.

Created from the tiny nucleus of the old Air Corps, the Army Air Forces developed and expanded to become the greatest Air Force the world has ever seen. That mighty Air Force tried out, in the laboratory of the world's greatest war, the tactics and techniques, the doctrines and the concepts, which had been taught by the old Air Corps Tactical School and which in very considerable measure had been created by that school.

As was perhaps to have been anticipated, the tactics and techniques which had been taught were rendered largely obsolete before the time came for their employment. Rendered obsolete not only by the great advances in aircraft and equipment, but rendered obsolete to an even greater degree by the enormous development in aerial warfare which had been produced by our gallant allies of the Royal Air Force through those first hard years of war—a development which they shared with us generously, completely, and wholeheartedly.

Harking back to those days of great effort to expand in 1941, and those dark days of 1942 when our still tiny Air Force was feeling its way into combat, the Army Air Forces have a profound sense of gratitude for that sharing of experience and knowledge. The lessons which were made so freely available to us had been dearly bought in the hardest of all schools — the school of trial and error in the midst of a bitter war.

Remembering that freely given pooling of knowledge and experience, it is an especial pleasure to be able to extend a particular welcome to the representatives of the Royal Air Force and the Royal Canadian Air Force. If our efforts here serve, in any measure, to repay the Army Air Forces' debt to your services, it will be a great privilege.

Among the students of these first classes of the Air University we are especially pleased to have representatives of our sister services, the United States Navy and Marine Corps and the Army Ground Forces. We welcome you wholeheartedly to the Air University.

The Army Air Forces believe strongly and completely in unity of command and unity of effort. But to realize the full benefits of unity of command and achieve true unity of effort, there must be mutual understanding and mutual comprehension. Your presence here constitutes a definite forward step toward attaining such mutual understanding and comprehension. . . .

As for the rest of you students, who are the Army Air Forces' own, I not only make you heartily welcome to the Air University; I extend you my sincere congratulations upon your selection as students. To the eternal credit of the Army Air Forces, there is not a man among you who is here because he was "available." We have not as many Air Force students as we should have liked. We might have had many more if we had relaxed our standards and taken those who were quite available. This has not been done. The standards have been maintained and it is our hope they will always be so maintained even if our classes must continue understrength for years due to the vital need for our scarce experienced officers in many important assignments.

I congratulate you on your selection not only because it is a mark of distinction to be so selected, but because of the experience you are going to have here. I say to you quite frankly and without embarrassment at the complete lack of modesty, that the schools you are going to attend will offer you the best courses in military education that have ever been made available to the Army Air Force officers. I doubt there is an officer in the Army Air Forces that would not benefit professionally, in some degree, in at least some of the many fields covered, by attendance at these schools. I consider you fortunate to have been selected. You have been selected with care and much is expected of you.

While the tactics and techniques which had been taught at the old Air Corps Tactical School might have been largely obsolete, it is of the greatest importance to note that the basic doctrines and concepts were *not* obsolete—they were sound. We set out to create and build up the Army Air Forces in accordance with those basic doctrines and concepts. If those basic doctrines and concepts had been wrong, we would have created the wrong sort of Air Force. That such was not the case is proven by the results of the Army Air Forces' employment both in Europe and the Pacific.

May our new Air University well and truly fulfill this most important role of providing and promulgating sound and true doctrines and basic concepts to guide the development of the Air Force of the future! . . .

THE GREAT TASK AHEAD

It is apparent from what has been said that we here at the Air University have a great task before us. For myself, I feel greatly privileged to be able to participate in this challenging undertaking. Many problems confront us. We must work together to find answers to these problems.

When I say that we must work together to find these answers, I mean precisely that. This must be a full partnership endeavor of instructors and students. That is particularly true in this first year when we are engaged in creating and perfecting our doctrines, our concepts, and our individual courses of instruction. We intend all students to be full partners in this enterprise. In selecting students an earnest attempt has been made to cover the whole field of our experience — experience in all the many theaters of the past war and experience in all the many varied activities of the Army Air Forces. The level of experience of these first classes has deliberately been maintained at the highest possible level. It is a far higher level than will ever be possible or even desirable in succeeding classes.

It is expected of you that you shall contribute fully, freely and frankly of

Shown before opening day ceremonies at Maxwell are General Carl A. Spaatz, Commanding General, Army Air Forces, Maj. Gen. Muir S. Fairchild, Commanding General of the Air University and Maj. Gen. George C. McDonald, Asst. Chief of Air Staff—2.

that knowledge and experience to the perfecting of our many courses of instruction. When your experience or your knowledge leads you to disagree with some point which is made or some theory or concept which is advanced, it is incumbent upon you and it is your duty to the Army Air Forces, to state your disagreement freely and frankly and argue the point out. Thus will be insured the soundness and correctness of our future courses of instruction and of those doctrines and concepts which will guide the development of the Air Force of the future. There is one action which can not be forgiven and which I sincerely trust students will not tolerate; and that is, to remain silent at the proper time for open discussion and later in the privacy of a friendly circle to criticize the doctrine or concept which had been set forth.

Do not get the idea from what I have said that we are doubtful as to the merit of the material that will be offered. We are not. It has been carefully prepared and carefully reviewed. However, it is manifestly impossible that any small group of instructors, no matter how able, should encompass within themselves all experience and knowledge in such broad fields as covered by the Air University. It is of vital importance to the future of the Air Forces that the *composite* experience and knowledge of our experienced Air Force officers be reduced to written form, the controversial points hammered out, and the whole prepared for promulgation to those of less and narrower experience before memory grows dim as to the lessons which have been learned in this greatest of all air wars. To accomplish this, we need and seek your help.

TRADITION AND LEADERSHIP

Much that has been learned during the past war is of permanent value. I think particularly of such matters as the priceless lessons learned in the field

of air leadership. Out of those lessons grew one of the proudest traditions of the Army Air Forces — that no bombing attack was ever turned back by enemy action. Such lessons and such tradition must be preserved and passed on to those who are yet to join the Air Force of the future.

But while some few such traditions are fine inspirational assets by any test, traditionalism in general is a deadly danger. Hence, one of the basic policies which we have adopted for the Air University is the avoidance of traditionalism, rigidity of thought and doctrine, standardization of instruction, and the provision of dogmatic answers to the problems of the future.

The Army Air Forces has never had to worry about this danger of traditionalism before. Up until this time we have never had binding, hampering tradition to contend with, except, perhaps, the tradition of nonconformity, of rebellion against the accepted traditional way of doing things, and of vigorous, forward looking thought. *That* tradition we must resolutely maintain!

Being generally free from tradition, we were free to think clearly, straightforwardly, and objectively. We were free to advance and develop rapidly; to be flexible in our approach to problems and in our reaction to unusual and unforeseen situations; free to try new things and new methods, and to learn quickly.

Now, however, the situation has changed. The Army Air Forces has fought and won in the world's greatest war. Now we too have traditions. Now we too face the same problems of traditionalism and rigidity of thought and doctrine that have plagued the older services throughout the centuries. We must guard rigorously against the danger of looking backward too much, against the feeling that we have learned the answers to future war. We must be on guard against building up resistance to change, against taking the easy course of accepting answers from the past instead of the infinitely more difficult course of digging them out of the future.

These things we must do if we are not to follow some of the formerly important military elements down the road to decay and obsolescence. In this new air age, there will never again be time to learn, either from enemy or ally, after the emergency is upon us. If our thinking has been outdated and we have provided an obsolete force unsuited to the situation which confronts us it is quite apt to be all over, with a neatness and dispatch which will allow time for learning only three simple lessons: (1) we were wrong; (2) we have failed; (3) we have betrayed our country and our way of life to utter and complete destruction. As our great leader General of the Army Hap Arnold has so aptly said: "The value of Air Power to this country must now be measured in terms of survival."

A PRE-WAR SCHOOL SYSTEM

Thinking of these things, we have adopted another basic policy for the Air University. That policy is: This is not a post-war school system — it is a pre-war school system! You will find all instruction here atuned to that basic policy. It is necessary that your thought be so atuned also.

There is one lesson from the last war, however, which we must ponder most carefully to be sure we understand clearly all its implications for the future. That lesson is to be deduced from the circumstances of how the war came to us at Pearl Harbor. Thoughtful consideration must lead to

the conclusion that if the United States should ever again become involved in major war, a war will come to her in a similar fashion but on an enormously expanded scale.

Having due regard for the character of our people and our system of government, it is inconceivable that the United States will strike the first blow in any future major conflict. The implications growing out of the method of our entry into the last two World Wars are inescapable. If we are ever again to be involved in major war, there seems no doubt that it will come so again — but with a difference — a tremendous difference. That sudden blow will not fall upon some isolated outpost. It will be directed against our homeland itself — our vital centers of industry and population. The coming of global air power has made possible that which was formerly impossible and fantastic. We must be prepared to defeat, to mitigate, to ward off, to absorb, that now possible sudden blow of the future.

This line of thought has led us to establish another basic policy of the Air University which may be stated thus: "The most adequate air defense will never win a war for the United States, but its lack may well lose us one!" For this reason, you will find great emphasis placed upon the importance of air defense throughout the Air University. Particularly the problem of air defense of the continental United States is one of the most important that confronts our Air War College.

THE GLOBAL REQUIREMENT

In general we shall look backward only to analyze, to seek to deduce lessons and principles with which to attack the problem of the future. In attacking the problem of the future, of one thing we are quite certain: it requires thinking on a global scale. Air power, at present, let alone immediately prospective ranges, is global in its nature and its application. Global thinking requires the use of global maps and projections, and an utter discarding of the Gettysburg-map type of thinking of pre-war service schools. You will not see a Gettysburg map during your stay at the Air University — but you will see plenty of global projections.

Thinking along these lines leads us directly to still another basic policy of the Air University which we have stated thus: The ultimate objective of air power is to force the capitulation of an enemy nation by air action applied directly against the vital points of its national structure. Now this does not mean that this is the only mission of air power, nor that it is necessarily the most important mission at any given time; but it does mean that this is the final and ultimate objective which air power alone must seek to accomplish.

Many implications for the educational system of the Air University grow out of that statement of policy. It is quite apparent that he who would seek to plan for and direct the activities of the global Air Force of the future in accordance with this concept must be far more than a mere technician, no matter how able. Not only must he be thoroughly trained and grounded in the factual knowledge and technical skills of his profession; he must be so truly educated as to develop the ability to deal with problems, the solution of which involves thinking that goes beyond the manipulation of learned techniques or the use of prior formulations or practice.

THE POWER OF ORIGINAL THOUGHT

Thus the Air University will seek most earnestly to develop in students the power to solve problems by well ordered, resourceful and original thought, rather than merely to train them in information and the routine performance of techniques. The problems which will confront the planners and the leaders of our future Air Force encompass nearly the sum of human knowledge and experience, passing far beyond the technical and scientific field. He who would analyze the vulnerability of enemy national structures must comprehend their respective strengths and weaknesses in their industrial, their political, their economic, and their social aspects. Thinking of these things, we have stated the policy of the Air University to be to truly educate, rather than merely to train or to instruct.

Of course facts are required, and facts will be presented — but presented insofar as possible as tools or means to induce a fundamental capacity for clear thinking. It is our conception that factual knowledge so acquired will in itself be of much greater use than if the aim of instruction was the mere presentation of facts for themselves alone.

The application of these principles throughout the Air University must naturally vary in emphasis in accordance with the various scopes and missions of its several constituent schools and colleges. The Air Special Staff School, being a school of specialized instruction within each of several highly specialized fields, must necessarily concentrate the bulk of its attention upon the specialized subject matter under consideration. The School of Aviation Medicine is concerned with research and education on the fundamental problem of the physical and psychological capabilities and limitations of air age man himself. While primarily a school of professional specialization, the vastness of its field requires the broadest approach through all avenues of knowledge of man. The Air Tactical School, which is the basic school of the educational ladder of the Air University, will place major emphasis on the development of skills and techniques; but importance will also be attached to broadening the base of education which will be increasingly provided in the advanced schools of the Air University. The emphasis in the Air Tactical School is on the *how* of the application of air power. In the Air Command and Staff School the emphasis is almost equally divided between the *how* of the application of air power and the *why, when* and *where* of its application. The Board of Visitors of the Air University said of the Air War College: "In a very real sense the tone of the Air University will be set by what happens in the Air War College. This college is the apex of the total structure, emphasizing, as it will, planning and original thinking. . . . The Air War College will call for men who can entertain conflicting views and not be overwhelmed by unbalanced arguments or demonstrations."

As you see, we have tried to set a balance between the acquisition of skills and techniques, and the broad requirements of true education, according to the differing scopes and purposes of the several schools and colleges. There is one skill, however, which deserves special mention since you will find it emphasized most strongly throughout the Air University. This

is the skill of facility in oral and written self-expression. This is a skill required by all officers from the lowest to the highest. As a staff officer, one must present the results of one's work to one's superiors, clearly, concisely, and convincingly, or much or even all of the value of the work may be lost. As a commander, one must inform staff and subordinates on policies, intentions, and desires, so clearly and precisely as to prevent any possibility of misunderstanding. The Air University feels that the present standard of articulateness of junior Air Force officers constitutes a handicap to them and to the Army Air Forces. We propose to use heroic measures to raise that standard.

AIR POWER AND PEACE

I have tried to touch as briefly as might be upon some of the basic policies which we have adopted here at the Air University as guides and signposts for future development. In so doing, I have necessarily stressed the future and particularly future war. It may well be that some of our honored guests and others might feel that here is too much talk of future war and lack of recognition of the fact that the American people, in common with the peoples throughout the world, are heartily sick of war and long for and are prepared to strive mightily for peace. I, therefore, feel it necessary to state that we here at Air University are fully cognizant of that burning desire which we share fully and completely. Moreover, we are fully persuaded that the primary mission of the armed forces, and particularly of the Air Forces, is to maintain peace on terms acceptable to us and only secondarily is it their mission to restore peace should they fail in the primary mission of maintaining peace.

But we are also firmly persuaded that no armed force, including the Air Force, can be effective as an instrument for maintaining an acceptable peace unless it is clearly and obviously prepared for instant and effective action to overcome aggression in whatever situation may be created by the aggressor. Twice within living memory we have demonstrated conclusively that potential ability ultimately to create an instrument for the downfall of the aggressor is no deterrent to aggression and counts as nothing for the preservation of peace.

If our voice in the councils of the United Nations is to be strong for peace and the prevention of aggression, we must maintain before the world our status as a great power. Why is it that our voice is more powerful for peace than one of the minor nations? It is because of the estimate of others as to our actual military power and our ability and willingness to bring it into play to back our expressed ideals for the prevention of aggression that could lead to major war anywhere in the world.

If we would have our voice powerful and compelling in the cause of the prevention of aggression and the maintenance of a just peace throughout the world, we must not display weakness before that world and advertise our unwillingness to make the sacrifices required to cooperate with all peace-loving nations to translate our ideals into actuality. It has been aptly said that weakness can not cooperate with anybody. The clearest earnest of our intentions and aspirations, the most effective measure to strengthen our voice for peace throughout the world, is the creation of a truly global autonomous air force, clearly and obviously prepared for effective action anywhere

throughout the world. The cost of such an instrument of peace is a trifling premium indeed against the possible cost of still another world war — a cost which our way of life could scarcely be expected to survive.

We conceive it to be the high and noble goal of the Air University to educate and to aid in producing the planners and future leaders of that Air Force. It is our earnest belief that the more nearly capable our future Air Force in adequately dealing with any situation that may confront it, the less will be the likelihood of its employment in war. Should the Air University succeed in educating and producing such planners and future leaders that they may design an Air Force adequate that it need *never* be used, we shall have completely fulfilled our mission.

Source of Historical Examples

Man designs the test. Selection of one from many possible courses of action.

The choice may or may not have been sound. With man's impelling urge to lean on experience as a guide, the probabilities are high that the sounder course of action was not chosen.

Man implements and conducts the test—on both opposing sides. Flaws will inevitably appear in execution, with varying degrees of significance as they relate to end results.

Man records the historical experience and all too frequently this author is personally concerned with the features of that recording — prejudice or bias will have its impact here.

Historical students will evaluate the lessons to be derived from that experience. The overriding number will have a professional interest in the results of that evaluation. To the degree that these processes in the matter of historical analysis and interpretation resort to slant or distortion, immediate vested interest might be served, but it will be at a heavy long-term cost.

First analyze and evaluate the historical data of the opposing force, particularly if that force should have been the loser. Appraise it in terms of causative factors and features. Seek answers to two key questions: How did he lose? And why?

Slants and distortions will be much more readily detected and exposed in enemy operations.

Next analyze the factors contributing to success by these same approaches and techniques. You will find flaws of similar type and for similar reasons.

Focusing attention on flaws in design and implementations will form a healthy purpose in the mind of the student.

If he studies only his own successes for an impelling purpose to firm them up, he will derive an attitude of complacency removing the urge for further study. His lessons will be firmly supported by his unquestioned soundness of experience.

An attitude of mind that looks for flaws will detect,—will expose the fallibility,—will stimulate an urge for improvement that will lessen or remove those flaws in any future action.

The Air Force Historical Foundation is committed to the second technique for two important reasons:

1. It will focus on flaws and invite corrective treatment.

2. It will expand man's professional competence in expanding his comprehension of factors and features of war.

Maj. Gen. Orvil A. Anderson, USAF, (Ret.)

THE BEGINNING OF TACTICAL AVIATION

By ARCH WHITEHOUSE

The interesting and sometimes humorous story of how tactical aviation was actually conceived by a man named Benjamin Franklin; the impact of the flight of a gaudy hydrogen balloon on military history; how the kite balloon and a rickety old biplane changed the whole face of military operations; and how tactical aviation first went into action in World War I, are written here by a man who experienced much of it, Arch Whitehouse.

Although he was born in England in 1895, Arch Whitehouse has lived all but the first nine years of his life in the United States. An adventuresome spirit inspired him to work his way back across the Atlantic at the outbreak of the war on a cattle boat in order to enlist. After a short spell in the Infantry, he transferred to the Royal Flying Corps. He fought and lived through the Fokker scourge of 1916, rose to the rank of a Flight Commander and became a fighter pilot. He is officially credited with destroying sixteen enemy aircraft.

After the war, the Lindbergh incident aroused his interest in air adventure and technical aviation articles. In World War II, although he volunteered for action, he was induced to become a war correspondent, serving at the end with the U. S. Eighth and Ninth Air Forces

In 1956 officials of the Air Force asked him to write a book on the Tactical Air Command. Flying in jets as well as in all other TAC aircraft, he covered about 50,000 miles. His book, being published by Duell, Sloan and Pearce, will be released shortly.

Arch Whitehouse is pictured in uniform of U. S. War Correspondent — the only accredited correspondent entitled to wear "wings."

The original theory of tactical air operations was conceived November 21, 1783 when Benjamin Franklin, then the American minister at Paris saw Etienne Montgolfier's gaudy hyrogen balloon take the air with Pilatre de Rozier as navigator and the Marquis d'Arlandes as its passenger. This was the first time man had actually flown through the air. The voyage covered a distance of five miles at an altitude of some 300 feet in approximately twenty minutes.

The sage old gentleman of Philadelphia witnessed this dramatic event from his carriage in the Champ de Mars . . . . "Being a little indisposed and the Air [sic] cool and the ground damp," he wrote, "I chose to stay in my Carriage near the Statue of Louis XV, where I saw all that passed."

Dr. Franklin saw more than the festive celebration most Parisians made of the event. He later wrote to his friend Dr. Ingenhaus in Vienna:

It appears to be a Discovery of

great Importance, and what may probably give a new Turn to human Affairs. Convincing Sovereigns of the Folly of Wars, may perhaps be one Effect of it, since it will be impractical for the most potent of them to guard his Dominions. Five Thousand balloons capable of raising two men each would not cost more than five ships of the line. And where is the Prince who can afford to cover his country with Troops for its Defense, as that Ten Thousand men Descending from the Clouds, might not in many Places do an infinite deal of Mischief, before a Force could be brought together to repel them?

In that remarkable document Franklin's prophetic vision foresaw the future and summed up one of the prize axioms of today's tactical aviation. Back in 1783 Benjamin Franklin had actually predicted attack from the air. One hundred sixty years later the Nazi dictator Adolph Hitler was dropping paratroopers and airborne infantry into the island of Crete.

During our Civil War President Lincoln was the first to adopt the science of aeronautics on the Western Continent as an accepted integral part of the Army. Napoleon had been the first in Europe when he employed captive balloons for observation before Fleurus, Belgium on June 26, 1794. The morale effect on the enemy was enormous for they believed their every move stood revealed to the observers and "became completely demoralized."

Strangely enough, Germany, Great Britain and Japan did not recognize the value of aerial observation until President Lincoln had employed Professor T. S. C. Lowe to spot for the Northern Armies near Manassas. Lowe had employed a hot-air balloon and a primitive heliograph set. Thus a Professor Lowe became America's first chief of Aeronautics. His initial ascents were watched with interest by a young German acting as an official observer for the Prussian Army whose name was Count Zeppelin. Ferdinand von Zeppelin later became a Lieut. General of Cavalry and a hero of the Franco-Prussian War, but he is more widely known as the father of the lighter-than-air dirigible which years later ravaged the British Isles with bomb raids in World War I.

In 1862 Professor Lowe was assigned to McClellan's Army and made several daring ascents under enemy artillery fire. On May 4th of that year he reported correctly that General Magruder had left his position during the night. But while Lowe's general observations were generally sound, wise military authorities soon recognized that trained observers were necessary if the observation balloon was to be exploited to the full. Thus, on May 24th General Stoneman took over and made military history by directing artillery fire from another of Lowe's gas bags.

In that we have the first aerial platform for military observation and the first trained aeronaut to be sent aloft to direct ground operations.

All this was the modest prelude to tactical military aviation and its limitations were immediately apparent. The lighter-than-air balloon could only be employed as a fixed platform of observation. Its value was limited to the height to which it could be raised which in turn provided the angle of vision available to the observer.

Nevertheless, it held hope for eventual improvement and shrewd military minds realized that the efficient development of the captive balloon justified specialized training for aerial observers. It would require ground drills

for the lighter-than-air specialists to handle the balloon and the gas-producing equipment required to inflate the bag. Mobility was all-important, for it was necessary to set up the equipment as close to the enemy lines as possible — and be able to move out with speed if he took assault measures to neutralize the nosey intruder.

Such mobility could only be gained by lightening and simplifying the equipment. The ground crews had to be zealously trained, and above all these new techniques demanded the cooperation of all other services to aid in deployment during an advance or a withdrawal. But eventually this early form of tactical aviation would of necessity be self-sustaining if it hoped to fulfill its mission in any campaign.

Around the wicker basket of the captive balloon then were developed the first primary rules of tactical aviation. Men had to be carefully selected and trained for this specialist work, for after all the balloon was as much a space vehicle in the minds of those men as the supersonic rocket ship is to aviation mechanics today. The early aeronauts as they were known, had to have more than a general smattering of military knowledge. They had to immediately recognize and interpret the movements of infantry, cavalry and artillery. Previous to the advent of the military balloon there had been no such service paragon.

The trained balloon observer was expected to make a hurried ascent in this precarious device and within a few minutes return to the ground with a detailed map of the enemy's front area. He had to point out valuable targets for the artillery. He was expected to provide reliable figures on the strength of enemy troops and the objective of their movements. He had been instructed in drawing and cartography, so was prepared to produce a very comprehensive picture of the territory immediately ahead. There had been no such military expert before, but he was the forerunner of today's tactical reconnaissance aviator.

The old cavalry scout might, at great personal risk, make swift sorties into the enemy lines in search of some particular nubbin of military interest, but since he was limited to ground movement his observation was confined to his eye-level outlook in the restricted area in which he could move unobserved. In most cases too, his technical view was that of the cavalryman, not that of the tactical observer trained to view or seek out all phases of military activity.

The value of the infantry scout was likewise limited, since in most cases he was selected from a duty roll — not because of his percipiency or military judgment. Thus, he usually returned with a report of events that most influenced him as an infantryman. He looked not for weak points in the enemy's defense, but for the strong points that would cause the most trouble for him and his regimental comrades.

Within a short span of the next forty or fifty years — comparative speed for the old-time military mind — the captive balloon and the aerial observer were developed to some degree of perfection. By the opening of the Twentieth Century balloon companies were accepted features of most modern armies. Above all, the observation balloon gave eyes to the Army and the Artillery was no longer overprodigal with ammunition fired in blind salvo patterns, hoping that the laws of average would eventually reward with a direct hit. Also, they were at last keeping up with the range of their

weapons and knew exactly what they were hitting.

But continual improvement was necessary and the first advance in the design of the military balloon was carried out in 1897 when two German army officers, Major von Parseval and Captain von Sigsfeld produced the first version of the modern kite balloon for use in the German Army maneuvers of that year. The old spherical balloon had had to be discarded because it whirled in the air and made precise observation very difficult. The new "Drachen" as it was called, was of a long tubular shape, and fitted with a rudder-like protuberance at one end. This design, with a specially devised balloon harness kept the bag steady, but because of the angle at which the bag itself was held to the angle of the horizon, there was considerable strain on the cables and it was often damaged in high winds. However, it would remain steady in winds up to 50 m.p.h. whereas the spherical balloon was useless when the wind registered about 20 m.p.h.

The race for air supremacy, insofar as military balloons were concerned, was particularly keen in Europe where both Germany and Great Britain were carrying out extensive experiments during the close of the 19th century. While the Germans were concentrating on the development of an all-weather observation kite the British were more organization-minded and had placed the future of their new air arm in the hands of the Royal Engineers. The Engineers in turn relied on a treatise on balloons "for military purposes" which had been written almost a century before (1803) by one General John Money, a British officer.

Ballooning in the United States was still in the country fair amusement class, and Thomas Scott Baldwin was the outstanding American aeronaut of the time. His daring ascents and parachute jumping acts were staged not only in his homeland, but he was a ranking performer in Europe and the Orient. Baldwin built the first successful dirigible airship and made the first sale of such a craft to the U. S. Army. But by the dawn of the Twentieth Century the United States appears to have turned over all interest in lighter-than-air promotion to Count Ferdinand von Zeppelin who in 1900 had startled the world with his rigid airship flights over Lake Constance. The race now was between the lighter-than-air monster and the puny arrangements of struts and wires being assembled in a cellar in Dayton, Ohio, by two bicycle mechanics named Orville and Wilbur Wright.

About 1900 a Frenchman named Captain Caquot had invented a non-oscillating balloon which was an improvement on the German "Drachen." Caquot's design was more streamlined and carried three tail-rudders. It was much easier on its cables too, since it did not present such a sharp inclination to the horizon. This the British adopted and put through a series of severe trials during their Army maneuvers of 1903.

By the outbreak of World War I in 1914 both the Allies and the Central Powers had adopted an improved version of Captain Caquot's kite balloon and a smaller version was employed by the Allied navies for spotting submarines.

At one time the British made an early attempt to link the kite balloon with the camera; probably the first time the military mind had thought to combine the sensitive photographic plate with aerial observation. However, it may have been that the camera had not progressed to the

point where it could be adapted for long-range work until the early 1900s. In one test eight cameras were placed equidistantly about the basket perimeter, and after some valuable experimentation their early observers were able to photograph the entire terrain the balloon overlooked.

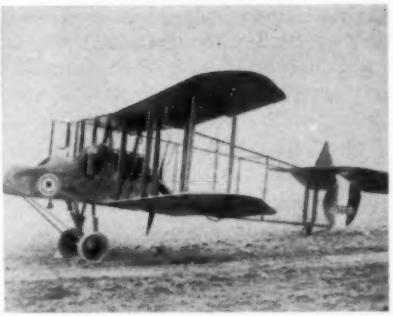
With the advent of the aerial camera the task of the observer became even more demanding. Now his visual reports had to be confirmed by the evidence on the photographic plate, a precise demand that exists even to this day. Even though the modern aerial observer is mounted in a 600-m.p.h. jet aircraft and is unquestionably the most completely trained military specialist, he still must stake his findings and reports against what he knows the Intelligence Officer will find on his aerial camera films.

This we shall see as this dramatic story of our tactical air force unfolds.

While the kite balloon made aerial observation feasible and put military observers into the air where they could look down and ferret out the enemy's movements, it had certain limitations, and these the opposition was soon ready to exploit.

Throughout military history the designers of munitions have always developed a defense to cope with the more recent offensive weapon. Primative warriors devised the shield to turn the sword or spear. Finer steel spearheads were hammered out to pierce the shield. Gunpowder and the cannon tube combined to level defenses or harry the movements of an attacking force. Armor plate was developed to thwart the spinning howitzer shell, and on and on goes the universal competition of weapon against the bulwarks of defense.

F. E. 2b.



This corps two-seater fighter was much used by the R.F.C. through 1916 and well into 1917. The author of this article flew these machines on the western front for many months before taking over the Bristol Fighter. It was powered with a 120 hp Beardmore engine and had a top speed of 73 mph. The gunner in front had a Lewis gun on a gas-pipe mounting. Another Lewis was set on a telescopic mounting which enabled the gunner to fire at attacking planes — over his own top wing — IF he stood with his feet on the edges of the nacelle!

While the kite balloon to some extent lessened the value of battlefield strategy and forced generals to use more caution in their troop movements, the artillery specialists soon concentrated on eliminating the kite balloon with a high-angle gun that could be aimed at and shred the flimsy gas envelope.

In that they were laying the basic design for an antiaircraft gun that was to prove invaluable in the coming world conflict of 1914-1918.

The kite balloon experts soon realized they could no longer peep over a sheltering wood or the fold of natural cover. Mobility was even more important, and it was necessary to operate from a higher altitude if they hoped to evade the shrapnel charge of the enemy's ground defenses. Larger capacity bags were introduced and the altitude capability was raised from 1,600 to 4,000 feet.

Now the observer could see even farther although his kite had been sent up at a safer distance from the front line. But now, his balloon was encumbered with 5,000 feet of steel cable.

No ground crew of men could possibly handle that much kite "string" so a winch was devised which could draw the kite and its crew down within a few seconds. Since the winch was mounted on a truck for operating power, it was discovered that the balloon had automatically improved its own mobility.

Now the kite balloon could be raised to a higher operating level and quickly lowered again, if attacked. It could then be whisked off to shelter or cover if the enemy gunners attemped to shell its ground bed. Thus, the tactical kite balloon had reached this stage when the guns roared the opening of World War I. Balloon companies were equipped with at least four kites. Their winches and cable were accommodated on high-speed trucks. The hydrogen gas used to inflate the envelopes was carried in handy pressure tanks racked on specially designed trucks or lorries. A simple panel of valves and gas gauges was all that was required.

That, and two skilled observers for each basket and organized aerial observation was ready for its first major campaign.

Next to be adopted was the airplane.

Few military experts of the early 1900s believed that the frail machine the Wright brothers had just invented could be used as an offensive weapon. They were satisfied that the kite balloon, and in a few specific instances, the dirigible might be of some value.

They pointed out that the balloon was ideal for field observation. It could be flown in silence. It could be used at night as well as day. It could be held at any desired altitude by means of a light steel cable. It was comparatively cheap to produce and maintain.

The Wright brothers were years convincing the world they had actually flown. What exploits and puny records had been set were mere ballyhoo for country fair exhibitions. The airplane was an unreliable performer and for years it languished unhonored and came to be considered as the expensive plaything of reckless young men in gay knickerbockers and reversed caps.

The airplane was not employed in warfare until early in 1912. Unarmed airships and airplanes took part in the Tripoli campaign of the Balkan war and while some historians have claimed that a few air battles took place, there are no reliable details of any such encounters.

The U. S. Navy had set up a flying school during 1912 at Pensacola and Captain Irving Chambers had developed an ingenious deck catapult for launching seaplanes from the deck of a cruiser.

On March 5, 1913, the first U. S. tactical aviation unit, the First Aero Squadron; was organized at San Diego, California. Its achievements in connection with the Mexican border expedition of 1916 against Pancho Villa, according to Air Force records, "were unimpressive; most of its obsolescent aircraft broke down during preliminary reconnaissance missions."

France was far ahead of the rest of the world in that she had already adopted the airplane as an integral part of her military arm. Indeed, during 1912 the French were laying out the preliminary work for the creation of a unified air service. A number of Voisin biplanes were being

flown in all military maneuvers. By 1914 France had 1,273 pilots, Britain 750, and Germany 680. At the same time the United States could boast of only 252 licensed pilots and less than 100 serviceable planes.

It seems incredible today to realize that the airplane, which had hardly reached the 100 m.p.h. mark or had flown more than 500 miles nonstop — and aboard which only the most daring had risked flights *over large cities* — was to become the deadliest weapon of a world conflict. A Frenchman named Pergoud had just won world renown because he had looped-the-loop and a fellow countryman named Legagneaux had struggled to an altitude of 20,900 feet — practically the same height at which our airliners today make their routine trans-Atlantic crossings.

While a few nations had set up military wings and had used the airplane as an adjunct to their scouting forces, there was no such thing as a bomber or fighter plane. No winged aircraft had gone aloft carrying a weapon of any kind. Radio communications was simply a much-publicized stunt and the few photographs taken from the air were fuzzy curiosities when World War I swept across Europe.

Gigantic armies of 64,038,810 men were to be mobilized. Of these 37,499,386 were to become casualties; 8,543,515 were to be killed or die as the results of their service and more than 21,000,000 were to be wounded.

But against these appalling figures and the conflict they represent the comparatively crude bamboo, linen and piano-wire airplane was to play a most important role. While the great armies were held immobile in water-logged trenches, pinned down by machine guns and mortar fire, the campaign was carried on day after day by the new warriors of the skies. War in the air — mainly a tactical war — became a reality in less than eleven years after the Wright Brothers had given the world the airplane! It took a little more than a decade for man to take that flimsy contrivance and remodel it into an efficient, if terrifying, instrument of war.

Within four years military airmen had bombed great cities from four-engined raiders. They had fought epic battles in the skies with six-gun fighters. Tactical aviators had taken nearly a million airplane photos, and during the last few months of the conflict airplane observers had employed radio voice channels to direct the gunfire of artillery batteries.

THE R. E. 8

This artillery observation type (Reconnaissance Experimental — Type 8) was produced by the Royal Aircraft Factory at South Farnborough, England for corps artillery cooperation. It was affectionately known as the "Harry Tate" — a popular music-hall comedian of those days. The air-cooled engine produced 160 hp and gave the aircraft a top speed of 102 mph. Early models had no armament but by 1916 fixed Vickers were provided for the pilot and a flexible Lewis for the observer.

Great twin-engined seaplanes scoured the high seas in search of enemy U-boats or were escorting transport convoys across the North Atlantic. By 1918 the British Navy was sailing redesigned cruisers as aircraft carriers and her Navy airmen were zooming from and landing safely

again on what we know today as flight decks.

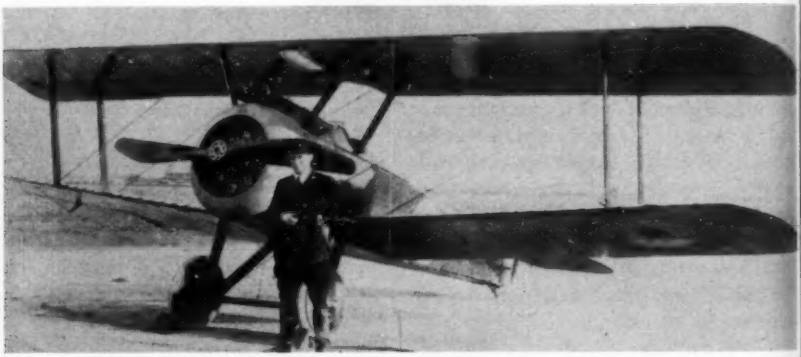
To some readers, all this will sound fantastic or unbelievable. Today we smirk at old photographs of those first wartime aircraft, and are prone to dub them "crates." We have seen their aerial antics in Hollywood movie versions of war in the air and probably discount much of their actual accomplishment simply because we cannot associate the real fighting or operational qualities of these primitive aircraft with their specifications and performance.

Nevertheless, the air battles of World War I were more dramatic and spectacular than any aerial engagement since recorded. The gnat-like fighters of the First World War established combat records that have never been equaled. For instance, one model, the British Sopwith Camel, a small biplane fighter, is officially credited with destroying 1,634 enemy aircraft —a feat no World War II or Korean campaign aircraft can match. Dozens of World War I airmen recorded glorious careers and shot down more than forty enemy aircraft. Only one fighter pilot of World War II accounted for any such figure, Major Richard Bong, who is credited with an even forty victories.

The widely publicized victory lists of the German and Russian services, because of their astronomical figures, cannot be taken seriously. They are obviously claimed for propaganda purposes.

During World War I British airmen alone destroyed 7,908 enemy aircraft

SOPWITH CAMEL



This was the greatest fighter of them all. The Sopwith Camel destroyed 1,634 enemy aircraft during its World War I career. It was a stubby fuselaged mount powered with a 130 hp Clerget rotary motor and a speed of 113 mph below 6,000 feet. It carried two fixed Vickers guns and was the most maneuverable fighter developed during World War I.

and burned 258 captive balloons. In about twelve months of front line aerial operations fliers of the U. S. Aviation Services accounted for 781 airplanes and 73 balloons. These tactical performances were carried out with fighter aircraft capable of less than 150 m.p.h. and which, in most cases, were armed with but two .30 (rifle caliber) machine guns. Today's jet fighters are capable of well over 600 m.p.h. and generally carry six .50 M. caliber weapons or 24-tube rocket pods. More important, thety are all metal machines.

However, such comparisons are odious and any attempt to explain the discrepancy in performance can only

lead into a very lengthy technical discussion which would add little to a report of this kind. Far more interesting is the presentation of the progress of the men and machines that have produced this unbelievable history of tactical aviation.

At the outbreak of World War I an air force was simply a detachment of winged observers; flying cavalrymen, some called the service. Indeed, it is a noticeable fact that most successful aviators of that conflict were ex-cavalrymen—men with fine hands and a fine degree of balance. Most of the German aces were formerly members of the Kaiser's finest mounted regiments.

The U. S. Aviation Section under the command of the Signal Corps made comparatively little progress during the first two years of the war, and by April of 1917 the service consisted only of seven flying squadrons and a personnel roster of 131 officers, including 112 qualified fliers and 1,087 enlisted men. None of the 103 planes were suited for combat. No U. S. flier knew anything of the practical application of airborne radiotelegraphy, photography, bombing equipment, compasses and other aviation instruments, which were by now familiar items to German, British and French aviators.

On July 24, 1917 Congress appropriated $640,000,000 to spur the development of U. S. airplane manufacturing capacity and during the rest of the war U. S. expenditures for aeronautics totaled $868,100,671. By November 11, 1918 there were 45 air squadrons on strength with a combined complement of 767 pilots, 481 observers, 23 aerial gunners and 740 planes. The air squadrons were organized as follows: 20 fighter, 6 day bombardment, 1 night bombardment and 18 Army or Corps observation. There were also 23 balloon companies which saw front line service.

At the outbreak of the war the Germans were so engrossed with the performances of Count Zeppelin's dirigibles that the heavier-than-air arm was initially neglected. What airplanes were available became the equipment of the Aviation Corps. Only France could boast of a separate air force. Great Britain had four squadrons on paper, and it was more than two weeks after the actual outbreak of war before a military aircraft was landed in France.

The first few weeks of the war saw practically no air combat. The first wartime airmen carried no automatic weapons of any kind, except perhaps a pocket automatic pistol. Gradually infrequent exchanges of gunfire took place, lengths of rusty chain were dropped on prowling biplanes. The French even turned out horse feedbagsfull of metal darts which could be showered on airplanes, kite balloons or even moving troops.

In the beginning military observers carried rifles, shotguns, cavalry carbines or even bags of bricks. The aircraft provided no gun mountings, gun turrets or bomb racks. Planes were sent out by both sides — but only for reconnaissance. Their actual value can be understood when we read how the scout pilots of the Royal Flying Corps, then a separate unit of the British Army, enabled the French and British ground forces to evade a German trap set along the Marne. Had it not been for this practical heavier-than-air tactical work the war might have ended disasterously for the Allies within the first few weeks of the campaign.

Whenever planes of the opposing forces met in mid-air there was little

BRISTOL FIGHTER

This two-seater marvel came out in 1917 and for many months was a scourge to the Germans. Because the gunner and pilot sat close to each other the attackers often mistook it for a single seater. Only when the gunner suddenly opened fire did the Germans realize they were taking on a machine that could protect its own tail. It had a top speed of 125 mph and was powered with a variety of Rolls Royce and Hispano Suiza engines. Varied duties were assumed with this plane from escort fighting to low-level ground attack sorties.

either crew could do about it, except perhaps to exchange rude grimaces and carry on with the work at hand. It was not until one frustrated young Britisher decided to take a sporting shotgun aloft with him that "war in the air" took on some meaning. When his pilot maneuvered close enough to a German observation plane, the Briton opened fire with both barrels!

There is no official record of his accuracy but shortly after the Germans naturally decided to counter with a carbine offensive. As a result, the first recorded air casualty was Lieut. M. W. Noel of the Royal Flying Corps who was "pinked" in the leg by a rifle bullet while flying over the village of Maffle. The "outrage" took place on August 22, 1914 — just eight days after the first four squadrons of the Royal Flying Corps had landed in France.

The machines the British took into action were mainly old biplanes, both pushers and tractors. Few could be flown across the channel. Most were delivered in their factory shipping crates.

The Germans were using Rumplers, Albatros, D. W. Fs, Agos and Friedrichshafens. Most of these planes were sturdy but not particularly fast, but their designs were basically sound for further development. The French were putting their trust in various models of the Henri and Maurice Farman, a Bleriot monoplane and a Morane with a high-mounted wing monoplane called a "Parasol" and the Voisin biplane.

These early tactical patrols often provided some very amusing situations. It was not unusual for a pilot who had been ordered to gather details of enemy troop movement, to fly across the enemy lines, land in some open field and then walk to the nearest village. There he would make on-the-spot inquiries in the local store or tavern. Following that open investigation he might have to bribe a couple of handy farmers to help him spin his propeller before he could get started.

On several occasions these hardy sky scouts had to take off with a patrol of Uhlans, lances and sabers flashing, galloping to head them off.

In those days it had occurred to no one that military aircraft should be marked to identify their nationality. As a result anything flying over a group of soldiers was fired on. It soon became necessary to protect the pilots by marking the aircraft with some recognizable insignia. At first national flags were painted on the wings or rudders, but flags required considerable detail work, so a simple circular design using the national colors was devised. Since both the French and British had red, white and blue in their national emblems they reversed these colors in their first insignia. The British used a blue outer ring while the

French painted the outer circle of their *cocarde* a bright red.

Bowing to this rule of aircraft identification the Germans decided to utilize their honored Iron Cross against a white background, but as the war progressed they found it more expedient to use a simple straight-barred cross.

Very few squadron insignia were noted on the front until the United States entered the war. One Belgian photographic Group used one of Palmer Cox's gay Brownies holding a large box-type camera; a design Walt Disney might well have been proud of. But the first widely-employed insignia was designed and flaunted by the American volunteers serving with the Lafayette Escadrille. These bouyant airmen believing their squadron should represent the true American spirit had a gaudy Indian head painted on the fuselages of their jaunty Spad fighters. Later the famed French Stork Squadron flew with a classic *Cigognes* design on the sides of their Nieuports and Spads.

FOKKER E-4

This is an advanced model of Tony Fokker's monoplane fitted with front-firing guns. In the E-1 he fixed a Parabellum weapon behind the prop and synchronized the fire to the rotation of the prop blades. With the success of that type, German aces next demanded planes with two machine guns. This is what Fokker gave them. It was powered with an 80 hp Oberursal rotary motor, an out-and-out copy of the French LeRhone. The fixed gun revolutionized the science of fighting in the air.

The British never went in for this squadron or individual insignia routine. It was their official opinion that to burden any particular squadron or pilot with an identifying marking was only adding further risk to an already hazardous career. Nevertheless, Captain Albert Ball's loyal mechanics produced a bright red nose spinner for his machine when he became Britain's leading ace in 1917. After Ball's death, the same honor was paid to Major Billy Bishop, V.C., only his spinner was painted a bright blue.

Once America got into the war, squadron and individual insignia were as much a feature of their fighting planes as the machine guns.

The next step in aerial hostility in this early sky war came when the Germans started dropping small bombs (by hand) on French and British troops. The British soon retaliated by filling old oil cannisters with bolts, nuts and explosives. The handles of the oil cans made them easy to carry and release over the side. The first air-ground attack of this kind was made on a German cavalry column near the village of Villers-Cotterets.

On September 5, 1914 a young pilot went aloft in a British-built Maurice Farman to engage a German raider, but since he took more than one hour getting to 1000 feet, the proposed duel had to be called off. The next day three planes of No. 2 Squadron R.F.C. intercepted a German Albatros. Very few rifle shots were fired by either side but by flying round and round the German aircraft, performing unbelievable antics, they forced it to land. The German pilot jumped out and escaped into the woods, so the British airmen landed nearby and set fire to

the Albatros using their old wick-type cigarette lighters.

As soon as the first aerial casualty was listed in the war news it became apparent that all aircraft would have to be armed, if only for their own defense. A few hours after Lieut. Noel's wound stripe was announced in orders an inoffensive-looking Farman complete with skids, bicycle wheels, the usual tangle of piano wire and two intrepid birdmen who signed their mess chits "Lieutenants L. A. Strange and Penn Gaskell" took to the air in search of glory.

An equally inoffensive German Albatros had been spotted making its way toward Maubeuge aerodrome and Messrs. Strange and Gaskell chuckled twice with commendable restraint and exchanged glances of smug satisfaction.

It seems that the Albatros merchant was in for something of a shock. Messrs. Strange and Gaskell had quietly affixed one (1) Lewis machine gun to the front of the orange-box structure known as a nacelle. The two British gentlemen frankly admitted malice aforethought. They'd show that German Albatros cove what aerial warfare had come to.

R.F.C. airmen used that sort of language in those days.

Unfortunately, Messrs. Strange and Gaskell had not made an accurate computation of their load and wing area, so in spite of Strange's best efforts and their combined lexicon of profanity, the Farman could not be persuaded to aviate any higher than 3,500 feet.

The German gentleman above, completely unaware of the fate planned for him, simply fluttered about at 5,000 feet, probably wondering what that hideous-looking contraption was doing 1,500 feet below. He was perfectly

ALBATROS D.3 SCOUT

This was one of the most popular German fighter mounts of 1916-1917. It employed much three-ply covering. Two Spandau guns were fitted and the engine was a 175 hp Mercedes which gave a top speed of 120 mph. It was a tough customer in the air but none too maneuverable in a scrap. In fact, it was somehat heavy on all controls.

satisfied with his lot. He was booking a few more air hours in his log — and how they loved their air time in those days!

To be accurate in reporting this Great War epic we should add that Penn Gaskell *did* fire one short burst at the inoffensive Albatros, but the immediate result was so astonishing, so clangorous, that Pilot Strange hoicked the outranged Farman into a violent zoom and almost tossed Mr. Gackell out of the nacelle.

So far as is known Mr. Gaskell never fully recovered and little has been heard of him since. Strange, of doughtier stuff, carried on somehow, came out of the war with a flock of decorations, a Lieutenant-Colonelcy and the tattered manuscript of his amazing adventures. He is the same gentleman who a few months later startled the whole front line by appearing suddenly out of a cloud, hanging by one hand to the top-wing Lewis gun while his Martinside scout flew about in lazy circles *on its back!*

But that is another story.

After that first thunderous burst, Strange opened his eyes, gingerly moved around in his seat and finally satisfied himself that the engine was still in its bearers and the tail section operative. Then, he says, he counted the wings, shoved his lower jaw back into place, and called it a patrol. They returned to earth because the law of gravity had been clearly defined, but made no report of their indiscretions for several hours.

Before midnight an official order ran up and down the British front to the effect that no more machine guns were to be mounted on any aircraft. That if any armament *was* required, would the observers please confine their experiments to service rifles?

But history discloses that this humorous incident did not end the experiments. Later Lewis guns were again fitted to Henri Farmans and other aircraft — after suitable reinforcing measures were carried out — and the technical details for a war in the air were settled then and there.

The first air battle involving a machine gun took place on November 22, 1914 when a British Avro engaged a German Albatros. The observer, Lieut. F. G. Small, fired two drums of ammunition (about 100 rounds) at the enemy machine. Nothing spectacular happened, but eventually the German pilot, a young sergeant, surrendered and landed in British territory. His observer, an officer, disgustedly kicked his N.C.O. pilot in the seat of the pants when they were being marched away as prisoners.

Where Compromised Solutions Are Failing

The profound effects of aviation have not been independent of other man-made features of the dynamic era in which we live today. Man's age-old struggle against anarchy and tyranny goes on in spite of technological advances. An aircraft (whether it be piloted, pilotless or ballistic) has no morals. Aerial vehicles are weapons of force or agents of commerce as men may choose airborne payloads for warlike or peaceful purposes. The prospects for the future indicated by the adaptation of aviation to the designs of men, however, seem to provide an intellectual challenge of the highest order for free and democratic people everywhere. Society yet lacks the methods, the institutions, and customs by which technological progress can effectively be channelled to the primary pursuit of a more perfect peace. A successful response to the aviation-spawned stimulus must be forthcoming if the progressive advancement of mankind throughout the ages is to survive even in our time. Most thinking men agree on the central problem posed by the impact of aviation upon human affairs. But disagreements are many and violent on what might be the best solution to this paramount problem.

AN AMERICAN PROPOSAL FOR STRATEGIC BOMBING *in World War I*

By COLONEL EDGAR S. GORRELL, U. S. Air Service

The origin of the concept of strategic bombardment in air warfare is, at best, a fuzzy story. Billy Mitchell's campaigns have been highly publicized, both yesterday and today. Even Mitchell's own admission of getting the air power gospel from Sir Hugh M. Trenchard in April 1917, is rather well known. Trenchard's early views on the employment of air forces, on the other hand, have been virtually unstudied in the United States. Though he finally wrote notable essays a decade after his retirement, Trenchard did command the world's first independent air force for ten difficult years and, in addition, schooled a generation of outstanding airmen like Portal, Tedder, Slessor, Saundby, Harris, Coningham and others. The highly literary works of Guilio Douhet, as is better known, have been much read and quoted by his critics and his disciples alike. More recently, a new claim for original thoughts on strategic bombardment have been thrown into the historical argument by Dr. L. B. Atkinson, who submitted Count Caproni's case into the pages of The Air Power Historian.*

*In the classical literature of air power, perhaps no thoughts have been more quoted but less studied than those of Edgar S. Gorrell of the U. S. Air Service.** Printed below for the first time, therefore, are key historical documents from the annals of American air power. They are the proposals for strategic bombing submitted to the Chief of the Air Service, General Benjamin D. Foulois, by Lt. Colonel Edgar S. Gorrell on 28 November 1917, and an examination of the subsequent consideration that they received. Of Gorrell's original proposal, General Laurence S. Kuter later said that it is the "earliest, clearest and least known statement of the American conception of air power." As a faculty member of the Air Corps Tactical School in the mid-1930's, Kuter made detailed studies of World War I records. The editors of* The Air Power Historian *are pleased to make available Gorrell's own account of the stillborn efforts of the United States to engage in strategic air operations during World War I. This account is excerpted from the "History of the Strategic Section, A.E.F.," prepared by Colonel Gorrell and dated 1 February 1919.*

Edgar S. Gorrell was placed in charge of the Technical Section of the Air Service in August 1917. Charged with responsibility for initiating purchases of aircraft, equipment and armament to build a fighting force, Gorrell had many opportunities to study Allied air operations in Europe and to write and talk with leading Allied airmen. In November 1917, American operational plans and organization were under review. Gorrell's proposal for strategic employment of air forces, including "round the clock bombing," begins the story recounted below.

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* Issues of July and October 1957.

** See biography of Gorrell in January 1958 issue.

In December 1917, the United States anticipated that the Air Force it was utilizing on the front would be of sufficient size by the Summer of 1918 to create what was then called the Strategical Aviation, Zone of Advance, A.E.F. It was to be comprised of 201 squadrons out of the total of 860 squadrons according to the plans approved by the Commander-in-Chief on September 18, 1917. These 201 squadrons were to be divided into: 41 Observation Squadrons, 105 Pursuit Squadrons, 55 Bombardment Squadrons.

In order to organize this force, Lt. Colonel Gorrell appointed Major Harold Fowler as his Executive Officer. Major Millard F. Harmon was placed in charge of making plans for the employment of the Strategical Pursuit Air Service. In order to profit by the combat experience of the Allies, Gorrell applied for, and obtained, the services on his staff of Wing Commander Spencer Grey, Royal Naval Air Service. This British Officer was considered a leading authority on questions dealing with aerial bombardment. He had been in command of the bombardment forces of the Royal Naval Air Service operating both day and night from St. Pol (near Dunkirk) against enemy submarine targets and submarine bases. Since the very inception of the war, Grey had been engaged in bombing operations including some of the most successful raids of the early history of the war. Much valuable advice was also received by Gorrell from Commander Lord Tiverton, R.N.A.C.S. who was, at that time, a member of the British Aviation Mission in Paris and who had previously participated in the British bombardment efforts from the region of Luxeuil against targets in Germany. The initial and continuing problem of the Strategical Aviation Section was the matter of organization and materiel.

The American proposal for a bombing campaign was submitted by Lt. Colonel Gorrell to the Chief of Air Service on November 28, 1917. This proposal, meeting with the approval of the Chief of Air Service, was adopted as the American approach toward Strategic bombing to which all planning and buildup should be directed. This proposal and its subsequent implementation well explains the fate of American efforts to engage in strategic bombing in World War I.

THE AMERICAN PROPOSAL FOR STRATEGIC BOMBING

November 28, 1917

I. *The Situation*

(a) General:

Three-and-a-half years of war finds us in a difficult and expensive position. On the sea, the Allied superiority keeps the Central Power's above-water ships inactive; while on land, where Allied and enemy trench systems face each other from sea to boundary on the western front, movement of infantry can only be obtained over short distances by vast concentration of artillery. The speed with which the infantry can advance is determined by the speed of movement of the artillery, and even a minor operation demands a heavy toll of life and material.

If the conduct of the War is to be seriously affected in the near future, a new policy of attacking the enemy must be adopted.

(b) Plans of Enemy and Allies:

Apparently, both the Allies and the Germans have begun at the same time to conceive the immense importance of aerial bombing. We find in all countries, both Allied and German, the conception of the immensity of such a problem and the beginning of a prepa-

ration for a bombing campaign. Judging from our own knowledge of what the Allied countries are doing and from the report of Allied spies in the German territory, the Allies are far behind the Germans at the present moment in preparation for next year's bombing campaign. We constantly receive reports from our spies and agents in the German territory, indicating an increase in the size of many German factories; about 25 German airplane factories have increased their facilities for output. Our information even shows that portions of the Zeppelin Works have been prepared to build bombing airplanes. It is certain that Germany is concentrating on the manufacture of the *Gotha* airplane, to be supplemented by pursuit airplanes. The recent activities of the German forces in bomb-dropping, especially by night, have been an indication of her probable use of these bomb-dropping airplanes next year; and the bombs which she is now using have also been an indication of the type of bomb she will attempt to drop upon the Allied forces.

(c) German Objective:

The German lines are so situated that bomb-dropping is a very easy problem for the German forces, compared with bomb-dropping for the Allied forces; and judging by the character of the airplanes Germany is building for bomb-dropping, together with the realization both sides have apparently come to,—namely that to affect the armies in the fields it is necessary to affect the manufacturing output of the countries. We can readily see that next spring and next summer the Allies will be visited by bomb-dropping airplanes, both by day and by night, and will be confronted with the enemy's superiority in the air and with a bomb-dropping campaign against them that will tend to wreck their commercial centers, to say nothing of the moral effect of such bomb-dropping against the inhabitants of the Allied countries.

(d) Steps Open to Allies:

This scheme which Germany is apparently planning to inflict upon the Allies is identical with that which the Allies have recently been talking about inflicting upon Germany. The difference between the two is simply that the German words are being rapidly turned to deeds, while the words of the Allies lack deeds to back them. Therefore, it becomes of paramount importance that we adopt, at once, a bombing project to be immediately put into force and carried out with all vigor at the quickest possible moment, in order that we may not only wreck Germany's manufacturing centers, but wreck them more completely than she will wreck ours next year.

(e) Allied Air Force Mission:

German shells are being fired at Allied troops and positions over a large area of the Front; but the manufacture of these shells is dependent upon the output of a few specific, well-known factories turning out the chemicals for them. We can readily see that if the chemical factories can be blown up, the shell output will cease, to a greater or lesser degree, dependent upon the damage done to these chemical plants. The same is true of airplane output: the large Mercedes engine plants and the Bosch magneto factories are located in the same city, and if bombing airplanes raid Stuttgart and can inflict damage on one or both of these plants, the output of German airplanes will cease in proportion to the damage done. Many of these points could be gone into at length, but it is not necessary here for the advantages of bombing manufacturing

centers is recognized without debate.

II. *Division of Bomb-dropping*

Aerial bomb-dropping is divided essentially into two classes; tactical and strategical.

(a) Tactical Employment:

Tactical bomb-dropping is becoming better known every day as the War goes on; and the results obtained by the individual Handley-Page squadrons in the vicinity of Dunkirk, as well as the sporadic bombardment against Dunkirk by the Germans, have more than indicated that wonderful results could be accomplished along tactical lines, should aerial bomb-dropping be really carried out in a manner which some of its ardent advocates have urged for a long time. The necessity for tactical bomb-dropping is evident and will come about as a matter of course. It is not treated in this proposal since the idea of this recommendation is solely that of strategical bombing against commercial centers and lines of communications with a view to causing the cessation of supplies to the German Front.

Credit: NATIONAL ARCHIVES

Brigadier General Benjamin D. Foulois (presently retired and the current President of THE AIR FORCE HISTORICAL FOUNDATION) was the Chief, Air Service, American Expeditionary Forces in Europe, in November, 1917 when Gorrell submitted his Strategic Aviation plan. This is a photo of an actual portrait painted during World War I.

(b) Strategical Employment:

By strategical bomb-dropping is meant, in the larger sense of the word, bomb-dropping against the commercial centers of Germany. An army may be compared to a drill. The point of the drill must be strong and must stand up and bear the brunt of the much hard work with which it comes into contact; but unless the shank of the drill is strong and continually reinforcing the point, the drill will break. So with the nation in a War of these days, — the army is like the point of the drill and must bear the brunt of constant conflict with foreign obstacles; but in this War, unless the nation which represents the shank of the drill constantly stands behind and supplies the necessary aid to the point, the drill will break and the nation will fall. The object of strategical bombing is to drop aerial bombs upon the commercial centers and lines of communication in such quantities as will wreck the points aimed at and cut off the necessary supplies without which the armies in the field cannot exist.

III. *German Targets to be Attacked.*

When we come to analyze the targets, we find that there are a few certain indispensable targets without which Germany cannot carry on the war. The first question to consider in an air offensive against such targets is the question of objectives and locations, and these can be divided into four main groups, following the general division made by English experts on this same subject.

(a) Dusseldorf Group:

The first, or Northerly group, com-

prises such towns as Dusseldorf, Grefeld, Elberfeld, Essen, and other German towns grouped in their vicinity.

(b) Cologne Group:

The second group is a collection of objectives, the center of which may be taken as Cologne.

(c) Mannheim Group:

The third and most important group comprises Mannheim and Ludwigshafen, and also the manufacturing industries in the vicinity of Frankfort, such as the Meister-Lucine Works at Hoechat, and the Casekka Works on the far side of Frankfort.

With the forces which the Allies will have available during the spring and summer of 1918, it is not wise to operate further south along the Rhine than the Mannheim group, except to make feints and infrequent raids against Karlsruhe and Bastahdt.

(d) Saar Valley Group:

A fourth group of targets enter as a part of a logical scheme for destroying German ammunition works, and these have special value for the reason that on days — such as often occur — when weather conditions prevent the airplanes from reaching targets in the Rhine Valley, bomb-dropping raids can nevertheless be made against targets in this fourth group. This fourth group comprises the numerous steel works of this Valley. . . .

IV. *Choice of Method of Attack.*

There are two classifications of bombing. One may be called "daylight bombing"; the other, "night-time bombardment." There are many arguments both in favor of and against each method of attack, but it goes without saying that our efforts should be directed against the German objectives both by day and by night, giving the Germans no rest from our aerial activities and no time to repair the damage inflicted. In this project, it is proposed to commense operations with daylight bombardment solely because of the question of availability,— since deliveries on our daylight bombardment airplanes will take place prior to deliveries on our large day and night bombardment airplanes of Caproni and Handley-Page type. This will lend itself readily to our final project of both day and night bombardment, since our pilots will be receiving training in aerial navigation over Germany during the day, while we are waiting for the arrival of our night-time airplanes.

V. Difficulties to be Encountered Which Necessitate Immediate Preparation.

(a) Navigation:

There will be considerable difficulty in instructing the pilots in the art of navigation when going very long distances, and course of instruction must be immediately established in the flying schools for obviating this difficulty.

(b) Maps:

The ordinary map of Germany in existence is not sufficient to permit green pilots to find their way across Germany and home again in safety. Therefore, the preparation of a special map of Germany must be begun at once, following the recommendations which the Army Air Service is prepared to submit to the Topographical Section of the Intelligence Division of the Army. This special map was that contemplated in a letter to the Chief, Intelligence Division, A.E.F., dated November 12, 1917, subject, "Aviation Maps for the American Army" signed by Brigadier General Kenly, requesting the preparation of such a map.

(c) Weather:

Weather conditions along the Rhine

Valley favor flying only during special times of year, — these being mainly in the late spring, the summer, and early autumn, — and therefore, if bomb-dropping against German commercial centers is to be feasible during the year 1918, preparations must be begun at once in order that we may be ready in time to take advantage of the weather.

(d) Procurement of Airplanes:

As indicated above, our advices show that Germany is already preparing a large bomb-dropping campaign against the Allies. The existing program of Allied production of airplanes is on too small a scale to manufacture a sufficiently large number in time for 1918, and therefore a decision should be made immediately to undertake this bomb-dropping campaign in order that the necessary impetus may be given to the production of airplanes to permit their receipt in time for such a campaign.

(e) Basis of Supply:

Assuming that each effective machine in commission performs four raids per week, — which, considering the short distance from our chosen bases to the Saar Valley targets, is not too optimistic, — the total output of bombs heretofore contemplated for next year on a basis of past aviation when bomb-dropping was not seriously considered, must be increased to meet the demands of next year. This increase can be easily effected if a decision is made and made now, to consider such a bomb-dropping campaign. Hence the necessity of an immediate decision for strategical bomb-dropping next year, in order that bombs may be ready when weather conditions permit the commencement of such a campaign.

(f) Transportation and Storage:

Considering the 50-pound bomb for calculation purposes, we find that two bombs will pack into a case about 2′6″ x 1′3″ x 2′9″, or about 120 cases of bombs may be placed on a railroad truck. In the quantities contemplated, the bombs will have to be dumped into ammunition dumps in the open and provision should be made as soon as possible to provide underground bomb dumps in order that we may not have the regrettable experience of seeing our bomb dumps blown up, as recently was the case at Dunkirk, where the Germans instead of attacking airdromes, attacked the bomb dumps and rendered the bombing airplanes useless because of having destroyed their bombs. Furthermore, in this question of bombs, the technical sections of the Allies must design watertight plugs, so that such bombs as are kept in the open or in underground dumps may be protected from weather conditions, thus necessitating keeping only the fuses and detonators in covered waterproof magazines. When handling such a large output of bombs as will be necessary for next year, we must consider that the following operations will be necessary: detonators and fuses must be put into the bomb; the fins must be screwed on; the bombs must be transported to the airplanes, and must then be loaded upon the airplanes. Working with such large quantities it is clearly necessary to commence immediately to train special armament personnel in the loading and handling of bombs. This is not a difficult question, but needs to be undertaken at the earliest moment. Another point in the bomb question is the transportation of the bombs by rail from the seaboard to the point desired, and when we consider that only about 240 bombs can be transported on an ordinary, average, flat car, we see that the transportation of sufficient bombs for a strategical campaign in earnest

against the German targets becomes a large problem, and one which the railroad authorities must take immediate steps to meet. This problem is not insurmountable nor difficult if steps are taken now, and without delay.

(g) Airplane Shelter:

The next difficult question is that of sheltering the airplanes. During certain parts of the year, with luck, our airplanes should last roughly three months when kept in the open; but during the other portions of the year, for example, the rainy season experience in Mexico shows that airplanes last only about two weeks; while French advices received about two weeks ago show that airplanes kept in the Toul region in the open, in the fall or in other bad seasons, last only about 8 days. It becomes at once apparent, therefore, that every attempt must be made to shelter the airplanes; otherwise the replacement of airplanes due to lack of shelter becomes an enormous problem. For this purpose, the United States is making provision to ship hangars to Europe with the various squadrons. Assuming the hangars arrived at the seaboard the question of transporting them to the bases in the vicinity of Toul in sufficient numbers, or to wherever the airplanes may be when they are at the Front, becomes rather difficult. Two thousand daylight bombarding airplanes of the DH-4 type would require about 500 Bessonneau hangars. Since about 10 railroad trucks are required to transport 4 Bessonneau hangars, we see at once that for even as small a number of airplanes as 2,000 we should require 1,250 railroad freight cars to transport these hangars. America is planning to adopt individual tent hangars, but the problem of transportation remains roughly the same as in the consideration of the Bessonneau hangars.

(h) Personnel Shelter:

Since the bases are chosen in the vicinity of Toul and are in the country where it becomes rather cold in the wintertime, it will be necessary to provide shelter for the personnel. The amount of shelter will depend upon the size of the force involved. Due to the population of the country we cannot safely count upon billeting more than approximately one-third of our aviation personnel, and therefore the remaining two-thirds must be provided for, — say, perhaps in standard French barracks which, under conditions prescribed by regulations, will accommodate 90 men per barracks. The question of figuring the housing necessary becomes one of mathematics as the force increases in size, but it is necessary to commence now, owing to the scarcity of material for building purposes in order to obtain sufficient barracks by the time the airplanes are ready for the bomb-dropping campaign next year.

(i) Air Routes:

Having chosen our first bases from which the airplanes will commence operation, it is necessary to choose landing fields, after the Italian system of one about every ten miles, from the point of assembly of American airplanes to our probable positions at the Front; to indicate on each landing field the portions where airplanes may land and to erect wind vanes to indicate the direction of the wind. These will be easy to keep up after they have once been established; but the labor of locating these fields and marking them should be undertaken immediately since it is one of the small points which is essential for success next year.

(j) Squadron Base Sites:

There are very few places in the vicinity of the entire Verdun-Toul bases where one can land, and there

fore details should be out at the present moment choosing these landing places and marking them so they may be used either as airdromes or as emergency fields.

(k) Meteorological Needs:

The weather in the Rhine Valley does not by any means follow the weather on the French side of the Vosges mountains, and experience has shown that it is not satisfactory to rely upon existing weather reports as they are predicted today. Meteorological officers should, therefore, be sent out at once to study weather conditions in the Rhine Valley between now and next spring and summer, and reports should be received from our agents in Germany to assist in the calculations of probable weather conditions.

(l) Objective Folders:

Our Intelligence Section of the Army Air Service will have considerable work to do in the preparation of the necessary data for such a strategical bombing campaign as herein contemplated, in order that up-to-date information may be had on all targets, so that proper maps may be prepared and proper instructions given to the various commanding officers and even to the individual pilots and observers.

(m) Communications:

Any system of raiding such as contemplated herein means carefully prepared and timed plans, and in order that they may be carried out without defects, telephonic communication must be established between the various headquarters of groups and squadrons. This is a matter which must be done as soon as the airdromes are chosen, and work should be commenced thereon immediately.

(n) Rail Transportation:

The question of railheads and transports must be considered, since it will be necessary to install at various points railroad sidings; and, in the case of large bombarding airplanes it may be found necessary to run special narrow-gauge railroad tracks into the airdromes themselves. The difficulty of transporting spares of large bombarding airplanes like the Handley-Page, must be overcome at once by choosing the routes which permit transportation of the spares, since the large chord of the wings of these airplanes does not permit them to pass over every road in France, because they will not pass under all bridges. This means that special routes for transporation must be chosen.

(o) Roads:

The question of transportation between the various groups becomes difficult, since in some places the ground is marshy and chalky and since, under certain conditions, the Germans may command some of the roads by shelling if they desire; and it will, therefore, be necessary to choose specific roads in order to supplement such transportation as takes place by railroad, and the limited amount which can take place by air. . . .

(p) Aerial Navigation:

Navigating distances of 150 to 200 miles necessitates a special knowledge on the part of pilots and observers far beyond any instruction now being given in any of the Allied schools. Navigation is not the only problem, since a very large problem is that of teaching the pilots to know the country over which they are to fly. This means months of training on these particular maps of Germany, and pilots trained simply in the art of map reading as it is taught today, can never hope to accomplish their missions and return to their own lines in safety. French relief maps along existing lines should be made up of German terrain, and their

formation together with the natural features of the terrain should be indelibly impressed on the minds of pilots and observers during their scholastic training. Our own experience in the United States and in Mexico, and Allied experience in Europe, has shown that it is very easy for one or more machines or squadrons to start out to reach a certain point and return to their base, each believing that he has reached the proper point, when probably all, or nearly all, have reached unconnected points and not the target for which they originally started to fly. Therefore, a knowledge of Germany must be taught to the pilots and observers in their instruction period, and provision must be made at the Front to keep up this instruction.

(q) Force Attacks:

From both the moral point of view and also that of material damage concentration of our aerial forces against single targets on the same day is of vital importance, since it tends to hamper the defense and also to complete in a thorough manner the work which the bombardment is intended to perform. Therefore it is suggested that often all available airdromes should concentrate upon a single objective in a single day. For example, suppose 100 squadrons are available and it is desired to attack Mannheim and the Ludwigshafen Works. Assuming a timetable of three minutes between squadrons, this means a bombardment of about five continuous hours. If immediately afterwards, on the next possible day, Frankfort were attacked in a similar way (judging from the press reports of what has already occurred in Germany), it is quite possible that Cologne would create such trouble that the German Government might be forced to suggest terms if that town were so attacked. Furthermore, after a bombardment, the manufacturing works would be wrecked and the morale of the workmen would be shattered. It is also to be remembered that in chemical works, a fire once started will spread. With such a bombardment going on throughout such a length of time the organization of the fire brigade and fire protection in the already undermanned German villages would be broken down and, therefore, the results would be out of proportion to the immediate effects of the bombs. Germany has shown by her attempts to wreck havoc with the morale of the Allied nations, in such cases as the bombardment of London, that her own human nature lends itself to having havoc wrecked with it in similar manner. Press reports taken from German papers indicate that this conclusion is correct.

It cannot be pointed out that the scheme suggested herein is possible now; but it will be possible in the future only by taking the matter in hand immediately and working at extreme pressure from now on till operations are able to commence next year. Therefore, it becomes immediately essential to decide in favor of such an operation for next year, and to take the necessary steps to organize and put into operation such a campaign as that proposed herein. Neither can it be said that an operation such as this is impossible. All of us well remember the huge cry of "Impossible" that went up when it was proposed to concentrate enormous artillery attacks on the German lines — such, for example, as the British have concentrated during the months of August and September against the German Front. Every one of us can now see that what looked impossible in the past has become a reality, accomplished with ease in the present. So

with this bomb-dropping campaign; while the difficulties look large at present, they will become feasible realities if we only start immediately to prepare.

VI. *Future Operations.*

After starting the campaign as indicated herein, the difficulties connected with the commencement become negligible, but those connected with transportation and supply of both personnel and material become larger as the campaign increases in size, and it will therefore be necessary for railroad and material facilities to increase proportionately with the increase in size of the campaign, until we work up to a climax where our airplanes are dropping bombs on targets in the same proportion as when the artillery shells a target. Statistics will show very easily that, given a fixed amount of explosives to destroy a target, aerial bomb-dropping will reach and destroy this target with less explosive, fewer shells and less expenditure of money and human blood, than is required for the artillery and infantry to destroy a target of similar importance to the final issue of the campaign. For practically three years the artillery has constantly shelled German positions and the infantry has sacrificed an enormous number of human lives, only to gain an insignificant number of miles along the Front. With a similar expenditure in aerial bomb-dropping of money, material, and human beings, the transportation in the rear of the German lines and the supplies of all sorts of material to the German troops could long ago have been cut off.

VII. *Cooperation of the Allies.*

The targets chosen in this program to be attacked, and the bases from which it is expected to deliver our attacks, are the same as those contemplated by the British in their proposal to wreck the manufacturing centers of Germany and by the French in such programs as they are proposing. The British are seriously considering such a bomb-dropping campaign, but have not started in earnest on the necessary preparation for such a campaign. The French production program for both airplanes and bombs, as well as for personnel, does not lend itself to an attack on the large scale proposed during 1918 on the manufacturing centers of Germany. The money appropriated by the American Congress was appropriated with the idea in view of dropping the maximum tonnage of bombs on German manufacturing centers and means of transportation, and the American public as well as American industries and financial purse string lend themselves to this idea and have so lent themselves since the beginning of the War. We find America today building an aerial program with the sole idea of such a campaign against Germany as that outlined herein, and therefore, American backing of this program is certain. British participation in this campaign is also certain. French willingness to participate in such a campaign is certain, although her material, especially, and her personnel, to a minor degree, do not lend themselves to such a large-scale operation as either the Americans or the British are prepared to undertake. Therefore, since all three nations will be desirous of participating in such a campaign as this and to participate against the same targets and from, roughly, the same bases, it is suggested that coordination be made of the efforts of all the Allied land armies. Therefore, in view of the concentration mentioned herein, as well as other vital considerations, it is suggested as the proper part for America, especially in

DeHAVILLAND 4 BOMBER Credit: NATIONAL ARCHI

Although plans for a strategic bombing force were somewhat grandiose on paper, materia the Allies remained deficient to the end of the war. The strategic bomber which co carry out most of the plans simply had not been built by the termination of the w The airplane most frequently used for bombing missions was the one used for seve purposes, the DeHavilland 4, which is depicted here. The personnel in the cockpits not identified.

view of her aerial production, to take the initiative in bringing about such a coordination.

VIII. *Necessity for Immediate Action.*

Since a bomb-dropping campaign does not mean the mere supplying of airplanes and bombs, and since ma other features as heretofore indicat enter into a project such as that co templated herein, it is suggested t unless a decision is made to comme this campaign, and commence it i mediately, we cannot hope to oper

during 1918. Therefore, it is requested that approval of this project be given immediately and that the necessary authority to carry it out be granted, in order that it may be started without loss of time and may be under way in the spring or summer of 1918. If it is not begun at that time, it must go over until 1919. It is not too late yet to commence this campaign; but the time when its commencement is possible with success is drawing to a close, —hence the urgency of immediate approval of this scheme. . . .

[So ended the American proposals. We now turn to coalition planning for strategic bombing as writen by Colonel Gorrell in his "History of Strategical Aviation."]

Allied Consideration of Strategic Bombing

On December 22, 1917, a conference was held at French G.H.Q. at Champagne, wherein the following representatives participated:—

British: Major General Sir Hugh Trenchard, General Officer Commanding the Royal Flying Corps, in the Field.

French: General Duvall, Commnding the French Air Service, in the Field.

United States: Lt. Colonel E. S. Gorrell, Officer-in-Charge of Strategic Aviation, Z. of A., A.E.F.

At this meeting, General Trenchard told that he had been ordered by his Government to establish a force of bombardment aviation in the vicinity of Nancy for the purpose of bombarding the industrial centers of Germany; that whether or not the Allies intended to join with him in this work did not effect whether or not he continued such work; and that he intended to increase the size of his force and to push this work to its maximum extend in compliance with the orders of his Government on this subject. The French said that, in their opinion, it did not pay to heterogeneously bombard enemy industrial centers, and that the Allies must remember bombardment of Allied towns by the enemy was a much easier task than bombardment of enemy towns by the Allies; and therefore, not only from the point of view of the fact that the materiel was unavailable for this purpose but also from the point of view of the fact that the use of bombardment aviation as contemplated by the British did not agree with French tactical plans, and that the French did not expect to join in this operation. The American representative stated that it was the intention of the United States to also undertake this work along the lines now being commenced by the British, but that he could not pledge the United States or the A.E.F. to such a procedure for the reason that decision on that subject lay with G.H.Q., A.E.F.

During the Christmas Holidays, 1917, the Chief of Air Service, accompanied by Lt. Colonel Gorrell, visited Headquarters of the Royal Flying Corps in the Field for the purpose of discussing this question with General Trenchard, the General Officer Commanding the R.F.C., in the Field. At this meeting General Trenchard proposed that, since he had already begun to operate from the Nancy District, and since the Americans had yet to make their first beginning in this work, that the Americans profit by such experience as he may have gained and such installation as he may have established and place their first few squadrons with his forces in order to train the Americans and to allow them to profit by what experience the British may have already obtained. If the Americans had one squadron it

would be General Trenchard's intention to place this squadron in an airdrome with several other British squadrons, the combination of squadrons being commanded by a British officer. When the Americans had several squadrons they would occuy an airdrome by themselves, being commanded by an American officer, to report to the British Commander in that District. When the Americans placed a larger force in the field than the British had there, General Trenchard proposed to turn over the command in that district to the Americans and to allow the British to serve under an American Commander in that region. These propositions, because they offered both training and maintenance facilities to the American Air Service, both of which were lacking and both of which promised to be difficult to be obtained, were accepted by the Chief of Air Service. However, it may here be said that shortly after this conference General Trenchard was recalled to England and General Salmond took his place in the field. Later, approximately the summer of 1918, the British Bombardment Forces in the vicinity of Nancy were separated from the Royal Air Force in the Field and placed under the command of General Trenchard, who would honor the orders of no one except the British Air Ministry. General Trenchard received no orders and would acknowledge no superior in the Field, not even Marshal Foch, who we supposed to command the Allied force on the Western Front. This turn of affairs necessitated a change in the American atttitude towards the problems then confronting them. The Americans had recognized and loyally supported Marshal Foch as the Allied Commander-in-Chief, and therefore could not assist the British Independent Air Force in its efforts. It was therefore decided on June 18, 1918, by the Chief of Staff, A.E.F., that while operating in every possible way with air forces of our Allies, the Air Bombardment Force must remain an actual integral part of the American Expeditionary Forces. The Chief of Staff on this same date uttered the fundamental principles of the Bombardment Force when he said everyone must be impressed with the importance of the principle of the concentration of effort of each arm, and of all coordination and all effort to a common tactical end. He then said that all must be warned against any idea of independence, and all must know from the beginning that every force must be closely coalescent with those of the remainder of the Air Service and with those of the Ground Army. He further stated that in making agreements with the British it must be thoroughly understood that when the aerial forces reached a certain importance, the regions to be bombed would be designated by G.H.Q., A.E.F. and that the selection of targets would depend solely upon their importance with respect to the operation which the A.E.F. contemplated for its Ground Army.

The office of the Strategical Aviation, Z. of A., A.E.F. was being utilized for duties other than those belonging purely to this office, and it was proposed to also place him as Assistant to the Supply Officer of the Air Service. With this in mind, this officer wrote the following memomandum for the Chief of Air Service, which is quoted herein solely for the purpose of setting forth some of the problems which presented themselves as of January 1, 1918:

"AMERICAN EXPEDITIONARY FORCES

Paris, January 2, 1918

Memorandum for Chief of
Air Service:

1. It is of the Maximum importance possible at the present time that the officer detailed for charge of bombing should take up the reins if he is to bring an efficient, well-trained team to the front at the speed at which deliveries are to take place. Not only that this officer take up his own duties forthwith, but he must collect his technical staff around him without delay, and fight the thousand and one duties in the all-too-short time at his disposal.

2. The fact that the United States is only now entering into the contest, makes it almost impossible to obtain the number of specialist officers required, and the men chosen for these duties must be allocated to the best centers for their own instruction. The British and French after three and-a-half years of experience have decided on the personnel, spares and materiel required for their units, and the closest liaison is necessary for the officer commanding American bombing to reap the full advantage of their experience. It is probable that the original American bombing units will work under British command, and it is necessary to study the British organization with a view to blending in with it efficiently. The O.C.'s decision is required, after consultation with the British, as to the most important position from which to operate with a view to the preparation of various sites, and to determine the methods of supply of those sites. He must inspect the bombing units in order to become au fait with work in the field and to obtain a close understanding of the operations undertaken. He should inspect the English training schools for bombing, choose the commanding officers for the original units and see that they are competent, efficient and well-trained, and organize many other details.

3. Accurate bombing on a large scale is a new science and requires the entire time and study of the man who is to shoulder the responsibility for success or failure during the coming year. . . . With an efficient staff preparatory work can be divided into classes and so rated, and operations can be started by June, but not before. The person who is to be responsible for the success or failure must be on hand at all times to handle the staff and make the necessary decisions.

4. This is the class of work which we have promised our Congress, our Country and our Allies that we would do, and it is of utmost importance that we are prepared to carry it out wholeheartedly, efficiently and without delay.

Respectfully submitted,
(signed) E. S. GORRELL
Lt. Colonel, A.S.S.C."

ESG/H

An effort was made to set up an American organization for the Bombardment units of the Strategical Aviation of the A.E.F. similar to the organization adopted by the British because of the fact that the British had had experience in this capacity while the Americans had no such experience; because the British were already engaged in this work, and because it was essential that the organizations be similar in order to allow the commanding officer and any Allied officers engaged upon the work to realize the extent of the striking force under his command.

Thus at this date, December, 1917, American plans based their organization upon the "Group" to be the

smallest self-contained bombardment tactical unit. The Americans had no expectation of bombing by squadrons, but to bombard by groups and perhaps by various combinations of groups whenever the target to be attacked should be worthy of it.

Just after the middle of January, 1918, the Chief of Air Service was ordered by G.H.Q. to detail an Air Service officer for duty in the Operations Section (G 3), on the General Staff. Lt. Colonel Gorrell was relieved from duty as Officer-in-Charge of Strategical Aviation, Z. of A., and by Par. 7, S. O. 21, H.A.E.F., dated January 21, 1918, was detailed to report to the Chief of Staff, A.E.F., on February 5, 1918, for this duty.

During the first part of February 1918, the office of the Chief of Air Service was moved from G.H.Q. to Tours and Colonel R. O. VanHorn, Air Service, who had been detailed by the Chief of Air Service as Operations Officer in the Air Service, (which designation of Air Service was later ordered by the Chief of Staff, A.E.F., to be discontinued, for the reason that no such office existed within the Air Service) moved to Colomboy-les-Belles with his office force. The Chief of Air Service appointed Colonel A. Monell, Air Service, in the office of Colonel VanHorn to command the Strategical Aviation, Z. of A., A.E.F. Colonel Monell was assisted by Major Fowler, Air Service, and Wing Commander Spencer Grey, R.N.A.S. The work previously started was carried on by Colonel Monell for a month or so. In the meantime, Major Fowler was relieved from duty with this work and sent to command the American Air Forces with the B.E.F. in the Field. Wing Commander Spencer Grey, R.N.A.S. becoming discouraged over the failures of the American Production Program and realizing in detail what would be necessary before America could begin a Strategical Bombardment campaign of any size, left the American Air Service and returned to the Air Service of his own Government. Later on Wing Commander Grey was attached to the Air Service of the U. S. Naval Forces, operating in Europe for the purpose of bombarding enemy submarine bases.

Colonel Monell, after having selected an airdrome at Latrecey, several bombardment airdromes on the Toul Sector, and an airdrome near St. Blin, and having seen that construction work was begun on each of these, realized that the larger problems that faced the strategical aviation operations of the Air Service were industrial. *He also also realized that the pursuit operation of strategical aviation would not and could not become a reality for several years, due to the failure of the Allies to deliver pursuit planes to the American Air Service in accordance with their promises made in the Fall of 1917, and due to the fact that no pursuit machines, because of such promises, were being constructed in the United States.* Therefore, there remained only one possible future for the Strategical Aviation, — that was aerial bombardment. The D.H. airplane was being handled satisfactorily at Romorantin insofar as its assembly was concerned. However, the assembly of the Handley-Page airplane presented a more difficult situation and thereafter Colonel Monell concentrated his attention upon the question of the night bombardment program.

The use of the word "Strategical Aviation" had led many persons, in and out of the Air Service, to believe that this operation of the Air Service was something independent from the rest of the Air Service and not de-

pendent at all upon the rest of the Army. In order to eliminate such an idea and to cause a realization of the fact that the Strategical Air Service was employed as an integral part of the Air Service, A.E.F. and therefore of the entire A.E.F., and in order to force a realization of the fact that American Bombardment Aviation should and would be used as a combat arm upon missions synchronizing with and coordinated with the missions of the entire A.E.F., the name Strategical Aviation was changed in the Summer of 1918 to "G.H.Q. Air Service Reserve." This change had the desired effect and brought home the realization of the fact that this bombardment aviation was a combat portion of the Army designed for use upon missions accordant with the entire use of the A.E.F. in Europe.

Plans were made in G 3, G.H.Q., A.E.F. for the future use of the Bombardment Aviation when it should arrive at the size consistent with its being used as G.H.Q. Air Service Reserve. It was contemplated that any bombardment units in existence prior to the time when this reserve had reached a growth sufficient to justify its creation as a G.H.Q. Air Service Reserve, would be used as a part of the Army Air Service of the various American Armies in the Field or in some specific cases units might probably be placed with the British Independent Air Force, later known as the Inter-Allied Air Force, for the purpose of receiving training in long-distance bombardment, it being understood by the nations concerned that our bombardment forces must remain an actual integral part of the American Expeditionary Forces.

Looking at this Section previously known as the Strategical Aviation Z. of A., A.E.F. and gazing upon it with a hindsight view of one year, in January 1918, the time when the plans hereinbefore quoted were originally made, there are two great faults which are easily seen:

(a) Entirely too much optimism was felt for the American Production Program.

(b) The Air Service failed to secure the approval of the General Staff of its plans for the employment of this aviation and consequently suffered from the fact that its plans for the use of the Strategical Air Service were not synchronized properly, especially from a mental point of view of its employment, with the ideas of the G.H.Q.

These, of course, are hindsight viewpoints.

The second point is excusable only upon the grounds of inexperience, but the first point presents the same facts as effected the entire Air Service; namely, a program far too large to be realized in the length of time allowed for its production. There is no one to be blamed for this program for it had the approval and encouragement of the highest authorities in Europe, and it was only cold matter-of-fact experience which proved to the world that money and men could not make an air program overnight, and that the time to prepare for war was not after war had been declared but, as quoted from the first President of the United States: "In time of peace let us prepare for War."

Quote: Joe Stalin

"The history of old Russia is the history of defeats due to backwardness. . . . In ten years at most we must cover the distance which separates us from the advanced countries of capitalism. . . . Look into everything, let nothing escape you, learn and learn more. . . . We must study technology, master science."

—Joseph Stalin, in 1931.

THE USAF AND ASTRONAUTICAL DEVELOPMENT

By BRIG. GENERAL HOMER A. BOUSHEY, USAF

Among the contemporary problems facing airmen, the role of the U. S. Air Force in the coming conquest of space ranks high. Historic efforts of American airmen over the years to fly farther, faster, and higher are logically projected into man's present-day efforts to cross the thresholds of outer space. The portents of astronautics and its military exploitation, viewed in the perspective of Air Force experience in advancing scientific progress, is of interest to the readers of The Air Power Historian. *For this reason, the editors present the following thoughts on developments in the conquest of space as viewed by an informed officer.*

The following are excerpts from an address by Brig. General Homer A. Boushey before the Aero Club of Washington, D. C., January 28, 1958, as made available by the Office of Information Services, U. S. Air Force. General Boushey is Deputy Director of Research and Development, DCS/D, Headquarters, U. S. Air Force.

The age of space flight is beginning — perhaps sooner, and with more significance than some people expected. The conquest of space is vital to United States interests and we, of course, sincerely believe that the Air Force is the most able — and logical agency to explore and exploit this new frontier.

For over 50 years the Air Force has actively and aggressively pursued an experimental program aimed at achieving ever farther — faster — higher — flight. The natural extrapolation of Air Force flight is into space.

Prior to 1919 aircraft speeds had been increased from 40 mph to 150 mph. In 1932 Major Jimmy Doolittle flew at a speed of 294 mph. In 1947 Captain Chuck Yeager trailblazed our path toward space by flying the X-1 at supersonic speeds.

Some nine years later flight speeds had been raised to three times the speed of sound when the late Captain Apt in 1956 flew the X-2 at the highest velocity yet recorded for manned flight. Other speeds, such as for some ballistic missiles, and the expected flight speeds of the X-15 and boost-glide vehicles will, of course, be considerably higher.

Regarding altitude, by 1920, Major "Shorty" Schroeder had climbed to 33,000 feet. In 1934, Major William Kepner and Captains A. W. Stevens

and Orvil A. Anderson had reached an altitude of 60,000 feet in the manned balloon, Explorer I. Later in 1935 Stevens and Anderson reached an altitude of 72,000 feet in Explorer II.* Most recently, Captain Iven Kincheloe flying the X-2 exceeded an altitude of 126,000 feet — topping, as General White recently pointed out, 99 percent of our world's atmosphere.** Here again, the achieved altitudes for ballistic missiles, and expected altitudes for manned vehicles, the X-15 and boost-glide, will be much higher.

During these same 50 years, the Air Force program of Aviation Medicine has enabled man to survive at ever higher altitudes — and really significant advances such as the liquid oxygen system, G-suits, pressurized and conditioned cabins, and full pressure suits are now accepted as everyday items of use.*

These past Air Force achievements are well known, but they may not be recognized for what they really represent: steppingstones to space. Space flight is a natural extension of Air Force experience. Operation in space is, and has been, long recognized as our ultimate goal. Our flight "know-how," together with our ballistic missile developments and our growing family of experimental aircraft and space vehicles, provides the nation's springboard for man's true conquest of space.

Fundamentals of Astronautics

Astronautics is defined as "the science of travel through space." Within the Department of Defense, the Secretary has announced that he intends to establish an Advanced Research Project Agency (ARPA) which will direct, control, and manage all satellite and space programs, including Ballistic Missile Defense. Within the Air Staff, Lt. Gen. Donald Putt, DCS/Development, is responsible for all Air Force development — including astronautics — and one Command, ARDC, commanded by Lt. Gen. Samuel Anderson, completes our direct line of authority.

A few years ago, prior to the increased interest in rockets and ballistic missiles, the elementary questions for Force, Mass, Work and Velocity seldom appeared in the vocabulary of other than engineers. Now, many of our discussions in the "Post-Sputnik" era include not only these terms but others such as Apogee, Perigee, Orbit Velocity, Escape Velocity, Satelloid, and many others. A discussion of the fundamentals of astronautics, that is, the physics of space flight and human factors associated with space travel is intensely interesting. Unfortunately, the amount of material to be covered here does not permit us to include as thorough a discussion of these fundamentals as would be desirable.

To accomplish space flight we must resort to the use of rockets or some other type of reaction device to impart acceleration. Intuitively, it is recognized that enormous amounts of power must be expended to "escape" the earth's gravitational pull. Dr. Robert H. Goddard, at Clark University in 1919, experimentally demonstrated that rockets develop their propulsion solely by reaction rather than by "pushing against the medium." Sir Isaac Newton's third law of motion — "to every action there is an equal and opposite reaction" — holds true in

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* See Gen. Orvil A. Anderson, "Ballooning in the Stratosphere," *The Air Power Historian*, January 1957.

** See Gen. T. D. White, "At the Dawn of the Space Age," *The Air Power Historian*, January 1958.

* See Dr. H. Strughold, "Atmospheric Space Equivalence," *The Air Power Historian*, January 1958.

space as well as in the earth's atmosphere. This is an important truth, for it means that rockets can operate in a void. In fact, they are more effective in outer space than in the earth's atmosphere.

Goddard also laid down the fundamental requirements for practical rockets — most of the initial mass of the rocket must be propellant (that is, the vehicle must have a high mass ratio) and also, the rocket motor must develop a high specific impulse (that is, the thrust must be as high as possible with respect to the propellants consumed per second). The elementary equations in mechanics are:

—Force equals thrust, and is usually measured in pounds

—Force equals mass times acceleration

—Mass will remain constant but weight, which is dependent upon gravitational attraction will, and must vary inversely with gravity (For example, lunar gravity is about one-sixth that of the earth, so, on the surface of the moon a 180-lb. man would "weigh" only about 30 lbs. yet his mass would be just the same . . . .

Thus we can understand how a rocket motor operates. The exhaust gases are expelled in one direction, with the rocket vehicle itself, as a consequence, being propelled in the other direction. But now, we are "moving things," and that's work, by definition. Work is simply a force exerted through a distance (or, if you prefer, a mass, accelerated through a distance). Next, let's discuss power. Instinctively we all realize that space travel will require the expenditure of enormous powers. The speed and force of a falling object give us an appreciation of the power required to reverse "the falling process," particularly when we realize true space travel demands placing a vehicle high enough, and with enough velocity, so that it may never return . . . .

To reach interplanetary space, man must travel through our earth's atmosphere. In the upper limits is a region of ultraviolet and cosmic rays, meteorites, fantastically low pressures, and, extremes of cold and heat. The ionosphere, as its name implies, is a region of intense electrical activity and it is made up of four distinct layers. Starting with the lowest, each layer is stronger in ion concentration than the next.

From minus 67°F. in the lower region of stratosphere, the temperature of the atmosphere fluctuates widely until in the lower levels of the ionosphere it is believed to be quite high. However, at this altitude, temperatures do not have the same meaning as they do at sea level. Even though a gas composed of widely separated ions may have a very high temperature, the temperature of a space vehicle would be scarcely affected by its immediate surroundings, but rather its temperature would depend exclusively upon its rate of absorption and radiation of solar energy.

Within the solar system, together with our earth, there are nine major bodies. Mercury, Venus, Earth, and Mars are usually known as the inner planets with the remaining five being called the outer planets. They are relatively remote from the sun and Pluto is the outpost of the solar system. It is over three and one-half billion miles from the sun and requires 248 years to complete one revolution around the sun. The vastness of space is difficult to comprehend. Because of its nearness, our moon is most certainly destined to be the first of the other

worlds of the solar system to be explored by man. Dr. Edward Teller, recently, when asked what he expected to find on the moon, answered, "Russians."

The Race for the Control of Space

Dr. Walter A. Dornberger, who, as a Major General, headed German rocket development during World War II, recently summarized [in his book, V-2] the history of the German V-2 development. It is interesting to note that the German Army started serious development of military rockets as early as 1930. After proving that liquid fuel rockets could be built, the Rocket Experimental Station at Peenemünde was established in 1936 near the Baltic Sea as a combined effort of the German Air Force and German Army. It was a military institution organized as a research institute, combined with a production plant. The mission of this installation extended from research and development, through production, training of troops, and supply to the front. Scientists of Universities were only called if there was a scientific problem to be solved — not to be discussed, or analyzed.

The Peenemünde Group recognized the long-range guided missile field and coming space age at an early date. Their long-term program for space systems included automatic long-range ballistic rockets, manned and unmanned hypersonic gliders and satellites, and finally, manned space vehicles themselves. In addition, they recognized the eventual need for high energy propellants, nuclear rockets, ion rockets and photon rockets. After the war, only 180 of the leading rocket men from Peenemünde came to the United States. More than 4,000 specialists of all types went to Russia with all the Peenemünde equipment and the Nordhausen production facilities. After 1948 the Russians isolated the German specialists and finally sent them back to Germany. The Russians had learned enough to continue by themselves.

Today, we find ourselves in not only an ICBM race with the Soviets but in a race for the control of space itself. It has been axiomatic that whoever controls the air space can exert control over the land and seas beneath it. Similarly, it will be true in the future that control of space will permit control of the earth's surface. It is necessary that the Air Force establish, as a goal, Superiority in Space, and that the Air Force program be directed toward that end.

The Air Force program in which we are presently engaged includes our first operational space vehicles; the Intermediate Range and Intercontinental Ballistic Missiles. Although these are not the subject of today's discussion, the rocket technology and hardware from these programs provides us a significant present capability.

Man's first step into the periphery of space is planned in the X-15 experimental aircraft. The X-15 is a rocket-powered, manned aircraft for research in aerodynamic heating, stability and control at over 3600 mph and to an altitude of over 100 miles. Approximately five minutes of "weightless" flight can be achieved and, when the X-15 re-enters the denser atmosphere at lower altitudes, it can duplicate the rate of heating of re-entry of a true space vehicle . . . . During its research mission, the X-15 will operate essentially outside the atmosphere. While not as glamorous perhaps as the proposals for space systems, the research and technical development effort required in areas such as engines, propellants, materials, hypersonic

flight, guidance, etc., is of fundamental importance. Without the background component work, space systems of any kind would be impossible.

Moon Control as a Military Goal

It has been stated on numerous occasions that the creation of a military base on the moon is a mandatory and inevitable military goal. From a scientific standpoint, a manned outpost on the moon has obvious uses. The absence of an appreciable atmosphere makes it ideal for an astronomical observatory site. Earth weather tracking and communications relay uses are readily apparent possibilities. For military purposes, the advantages may not be quite so obvious, and there is divided opinion as to whether or not a manned or unmanned moon base has any military significance.

Before any such discussion can be profitable, it is necessary to review the characteristics of the moon as they affect its use as a military base. It is roughly 239,000 miles from earth, or perhaps two or two-and-a-half days time by rocket. Lunar gravity is about one-sixth that of the earth. It is virtually devoid of atmosphere and rotates so that one-half of the lunar surface continuously faces earth; and the opposite half never does. It is about one-quarter the diameter of the earth, and, until proven otherwise, we must assume that it is composed of similar elements.

Let us analyze a military situation on the basis of only these six factors and one assumption. From an energy standpoint, only $\frac{1}{5}$th or $\frac{1}{6}$th the energy is required to shoot a warhead from the moon to earth, as vice versa. Since there is no atmosphere, perhaps warheads could be catapulted from shafts sunk deep into the moon's surface and sufficient velocity might be imparted during the "catapulting" alone to reach moon escape velocity — $\frac{1}{5}$th that for earth. So, for moon vs. earth from an energy point of view, the moon represents the age-old military advantage of "high ground."

Next, consider that a missile launched earthward could be observed and guided from start to impact. The reverse is not true. The rotation of the earth would necessite multiple tracking and guidance stations — and weather might interfere.

Next — a missile attack launched from the earth to the moon could be observed from the moon, with perhaps 48 hours to take counteraction. Even if a nuclear detonation occurred near, or on the lunar surface, there would be no blast effect, since there is no atmosphere, and protection against thermal, x-ray, and neutron radiation would be easy for there would be many hours warning to compute lunar impact locations and for personnel to go underground. Further, since missile speeds for approach and lunar impact would be far less than those for earth impacts, anti-missile efforts from a moon base would be easier.

Lunar outposts and even launch sites could be located on the far side of the moon — never to be seen from earth — yet earth locations could be viewed by telescope from the moon. A resolution of objects less than one hundred feet in length (and with new techniques perhaps half that size) could be accomplished with modern size lenses.

With man and his intelligence once established upon the moon, the possibilities of construction and creation of an artificial environment are virtually unlimited. Energy would abound—either from solar sources or radioactive minerals. Storage of vast quantities of energy would be possible, for without

atmospheric drag, huge inertial flywheels would spin for months with negligible frictional loss. Synthetically, vast quantities of rocket fuel could be made from the minerals of the moon and stored underground.

Oxygen could be extracted from the oxides of the moon in ample quantities, and water could be produced from ore in a like manner.

Last, and most important, the moon provides a retaliation base of unequalled advantage. If we had a base on the moon, either the Soviets must launch an overwhelming nuclear attack towards the moon from Russia two or two-and-one-half days prior to attacking the continental United States (and such launchings could not escape detection), or Russia could attack the continental U. S. first, only and inevitably to receive, from the moon some 48 hours later, sure and massive destruction. It has been said that "He who controls the moon, controls the earth." Our planners must carefully evaluate this statement for, if true (and I for one think it is), then the United States must control the moon.

Space Superiority and World Peace

On January 16, 1958, Secretary Dulles proposed the formation of an international commission to insure the use of outer space exclusively for peaceful purposes, and, if the Soviet Premier is sincere in decrying the production of even more powerful weapons, he will jump at this chance. In ten years, the opportunity of jointly imposing control may have been lost. Senator Lyndon Johnson recently said that "whoever gains the ultimate supremacy of space, gains control — total control — over the earth for purposes of tyranny or for the service of freedom. Soviet control of space is the first aim of their national policy."

In conclusion, may I agree wholeheartedly [with Senator Johnson] and add that space is a natural and necessary extension of our present Air Force operations. We must contribute to an active national space program. But above all, we must insure the maintenance of a continuously adequate deterrent force. This force-in-being must be maintained and constantly improved. Whether it be jet-propelled or ballistic, manned or unmanned, and whether it includes space craft or lunar positions — it must at all times add to our national survival power. Within the framework of deterrent force, space flight can be employed to great advantage, and eventually, I believe, space superiority will become the primary factor in the assurance of world peace.

"Every year without war is a benefit to all mankind. But the Russians can conquer us without fighting, through a growing scientific and technological preponderance. Already today we are beginning to have some global control over the forces of nature. Throughout the world we already are beginning to change conditions. The planet will become smaller and smaller. What one country's technology is doing will obviously more and more affect the other countries. If the Russians go ahead faster than we do in this direction, then we will be just helpless. If we are not able to use freedom in the direction of accelerated progress, and if the Russians use their tyranny in this direction, they will win."

— Dr. Edward Teller, as quoted in *Time*, Nov. 18, 1957, p. 21.

Mather Air Force Base, California

". . . Then the batteries sent a spark into the engine, the propeller was given a turn and instantly there was a burst of explosions as the cylinders increased the revolution of the buzzing blades. Gradually, Lt. Buffington set the ship in motion, and, like a great bird, graceful and responding to the most delicate touch, the first airplane to ascend at Mather Field was sent into the sky!"

This was a part of the newspaper report by the *Sacramento Bee* on the first flight made at Mather Field, now known as Mather Air Force Base. The date was June 12th, 1918, shortly after the first class of 26 cadets had arrived at Mather to be trained as World War I pilots.

Mather, named in honor of Lt. Carl Spencer Mather, who was killed in an airplane accident at Ellington Field, near Houston, Texas on Jan. 30, 1918, five days after he had been commissioned, was on that date a barren waste of land, with unfinished dirt runways and flimsy hangars. It was one of the many airfields developed during the hasty buildup phase at the beginning of the war, for the training of pilots.

"Jennies" or Curtiss JN4s were the only training planes used in those days at Mather. Four of them had been assembled by the local Liberty Iron Works. They were equipped with an altimeter, tachometer, compass, gasoline and oil gauges. For gunnery training a Lewis gun, drum loaded, was mounted on a tripod on a center section, firing over the propeller and operated by a wire trip-cord in the pilot's seat. Small balloons or six-foot paper parachutes with small sand bags attached were used as targets, although it was said that often some of the farmers' prize cows were used as targets.

In 1920, a daredevil cadet named Floyd Keadle, who was often grounded for hedge-hopping, chasing farmers' cattle, etc., is reported to have flown a DH 4B, with a wing span of 45 feet, under a 50-foot span of the Sacramento River bridge.

Following the war, the base was not very active and was used primarily for an aerial forest patrol base, until deactivated in June 1922. Until 1930 very little activity took place at Mather, but in 1930 the U. S. Army Air Corps set a new world record for altitude combat formation flying. 19 planes of the 95th Pursuit Squadron, commanded by Capt. H. M. Elmendorf, reached an altitude of 30,000 feet.

In February 1941 Mather was re-activated and the entire base was reconstructed. Pilot training started in June 1941, and in August 1941 the first navigation school on the west coast was established here.

A B-25 pilot transition school was established in March 1943 and in Oct. of that year, the navigation school transferred to Ellington Field, Texas. In April 1944 Mather assumed the status of a twin engine pilot training school.

In September 1944, the Air Transport Command took over from the Training Command and set up an aerial port of embarkation for the Pacific Theater of Operations. At the termination of the war, the mission of the field was reversed and Mather was used as a debarkation terminal.

The Training Command again took over jurisdiction of the base and in 1946 a B-29 Flight Engineer School was established, until the mission became the training of the triple-rated navigator, bombardier-radar operator, in March 1947.

The primary mission of Mather today is the training of aircraft navigators, who are actually navigator-bombardier-radar observers. They are trained to fill the requirements of Strategic Air Command, the long-range striking force, and the Tactical Air Command, the short-range striking force.

AIRMAN'S BIBLIOGRAPHY

THE GREAT DETERRENT by Marshall of the R.A.F., Sir John Slessor, New York: Frederic A. Praeger, Inc., 1958. $6.00.

The development of airpower through World Wars I and II seemed at the time to move at a pace so swift as to render it difficult for all but a few farsighted men to make an accurate assessment of its impact on strategic and military policy. The blinding pace of developments in aviation since World War II, however, make the aviation happenings of the previous period seem almost leisurely by comparison. Strangely enough though, there seem to be more men who understand the significance of these recent rapid developments than there were men who understood the meaning of the earlier events. One of the few men to demonstrate a thorough and accurate appreciation of the meaning of airpower through both periods is the author of this book, Marshal of the R.A.F. Sir John Slessor.

It is hazardous for any man, but especially for a military chieftan, to try to predict the significance of changes in weapons and political relationships. The hazard lies in the fact that the military chief who attempts this will look backard too long and too fondly, and thus will have his vision beclouded when he attempts to look forward. No such tendency, however, is evident in the writings and lectures of Sir John Slessor. He not only looks backward but also forward and sideways, and he never lets the dead hand of tradition blind him to the true meaning of new weapons or new forces in ferment among the peoples of the world.

This book is a collection of lectures, articles and broadcasts on questions of military and strategic policy. The statements recorded in the book were written or spoken between 1933 and 1957 and, as General Alfred Gruenther says in his Foreword, "deal in provocative and challenging fashion with questions of high policy."

Throughout the book and in all his utterances Sir John pleads for a common United States and British policy and purpose. He sees great strength in the combination of the English speaking nations and ultimate disaster should we be divided. Such a view as this, based primarily upon an appraisal of military dangers and military necessities, emphasizes strongly the importance of N.A.T.O. and the need for even closer cooperation between the British Commonwealth Nations and the United States in the fields of economics, foreign policy, and technology.

Sir John is essentially optimistic about our position with respect to that of Russia. For instance, he considers that the Hungarian episode revealed that (a) the Soviet satellites are potentially our friends and not Russia's and represent a threat to Soviet bases and lines of communication, and (b) that the enormous destructive power of nuclear weapons makes it unlikely that there will be an all-out general war, provided the western world maintains the unquestioned capability to instantly retaliate in decisive fashion against a Russian nuclear attack or other attack against our vital interests.

On many other points of military doctrine the author seems to be in complete agreement with the leaders of the U. S. Air Force. For instance, he states that any disarmament plan adopted in the foreseeable future must not abolish the right of the western democracies to maintain an arsenal of nuclear weapons. Also, he believes that a strategic military policy for the Western Alliance must be based on the assumption that if the great deterrent fails

to prevent total war then the nuclear weapons will be used. He foresees any such war, as do our own Air Force chieftains, as being of relatively short duration, that is, lasting weeks or months at most. In discussing the role of missiles Sir John warns that missiles will not soon replace aircraft and that we must plan for at least a decade to rely on manned aircraft.

In discussing political policy the author bases his views on two significant personal conclusions. The first conclusion is posed as a question which Sir John answers with an unequivocal "No." His question: "Is it better to live as slaves of a conspiratorial dictatorship directed from Moscow than to die under the H-Bomb?" There are some in England and perhaps in this country today who might agree with Bertrand Russell and answer "Yes," but their number still seems to be a small minority as compared with those who would join with Sir John Slessor and answer "No" without reserve. In any event this question is one for the heart and conscience of each individual. How we answer it individualy will determine whether or not our democratic way of life survives.

The second basic premise upon which the author bases his conclusions with respect to strategic policy is that "for better, for worse, we are part of the Free World and the lynchpin of N.A.T.O. and, if we run away from our responsibilities, Europe is doomed." In the concluding article in the book Sir John discusses recent British defense policy. His explanations in this concluding essay are intended to justify recent cuts in British forces as being consistent with his own premise that England is "the lynchpin of N.A.T.O." The cuts in British forces have undoubtedly been made necessary by budget considerations, at least in the eyes of the British Government, but their effect is such as to make any explanation, even so convincing an explanation as Sir John's, inconsistent with the premise.

On certain specific points of foreign and political policy the author takes issue with U. S. policy. He favors, for instance, admission of Red China to the United Nations. He proposes a U.N. trusteeship for Formosa to be followed later by a plebiscite, and he suggests that Russia should be permitted ultimately to be a member of a mutual security system established for the Middle East and then for all of Europe. These views are advanced with candor and conviction, and supported by careful and objective analysis.

The student of military affairs and strategic policy will find in this book a wealth of information and ideas. There is so much of significance in the book that it should be studied rather than merely read, but the style is straightforward, almost conversational in parts, and therefore easy to read and understand.

R. D. P., Jr.

FIVE DOWN AND GLORY, by Gene Gurney, edited by Mark P. Friedlander, Jr., New York: G. P. Putnam's Sons, 1958, $5.75.

AMERICAN ACES, by Edward H. Sims, New York: Harper and Brothers, 1958, $3.95.

To a peculiar degree the American public has thought of the fighter pilot as the modern knight of battle — not just of air battle but of the entire war. Probably this is largely because the airplane became a combat weapon at the same time that wars had swelled into global struggles pitting millions of men and thousands of cannon and vehicles. So the public demand for individual heroes found its greatest expression in the one remaining form of individual combat — the fighter pilot. And of the fighter pilots the princes of the realm are the aces.

Not only the public has been affected by the fighter pilot. To other combat airmen — crews of heavy bombers who helplessly droned through flak-dotted skies while fending off enemy fighters, to pilots of fighter-bombers and light bombers who swept the decks through hails of enemy ground fire and gloomily contemplated the unromantic totals of locomotives destroyed and tanks busted — it frequently seemed that the fighter pilot got much more than his share of the headlines for a roughly equal risk of his neck or skill as a pilot.

But such is fame and no one ever claimed that fame is uniformly just. Certainly none of these more anonymous pilots would wish to deprive the fighter pilot of his just tribute, for none can know better than they how vital was the mission and how high was the cost. If these other pilots are not accorded their just due, we can but sigh and recall that since David and Goliath and the Roman gladiators' single combat has occupied a soft spot in the heart of man.

Both of the books listed above contribute to the understanding of the art of the fighter pilot, and both do it by a study of the most successful practitioners of the art — the aces. In *Five Down and Glory* Captain Gurney has performed a real service in researching the records of First and Second World Wars and the Korean War to come up with what is probably the definitive listing of the aces and their scores. This has long been a troublesome issue, complicated by the variations in rules not only in different wars but also in different theaters in the same war. Thus in World War II the European Theater allowed credit for enemy planes destroyed on the ground, while the Pacific and China-Burma-India theaters did not. Captain Gurney has noted these discrepancies and with the aid of the Fighter Victory Credit Board and many other sources has compiled an authoritative list.

With this as his foundation, Captain Gurney has written an interesting and lucid history of American aces in the Air Force, Navy, and Marines from World War I through the Korean War. He shows the development of fighter aviation in each of his contexts and then tells the story of individual actions that typify the operating environment and tactics of the war or the theater. In World War II he traces combat aviation not only service by service but in the Air Force takes the aces theater by theater.

Mr. Edward W. Sims limits his coverage in *American Aces* to stories about the twelve top surviving Air Force aces of World War II. In each of his twelve vignettes he sketches the war situation at the time that his action occurs, and then follows his ace through one mission — not necessarily the mission on which the man became an ace or on which he got the most kills of his career but the one that is most memorable to the pilot. He includes a map showing the course of the action in each narrative. We get exciting stories like the one of Colonel Bruce Holloway of the Fourteenth Air Force, who one day in 1943 directed his group in an air battle to fend off Zero-escorted Betty bombers from attacking Kunming airfield, at the same time shooting down one bomber, one Zero, and probably destroying another Zero. Or that of Captain Henry Brown of the Eighth Air Force, who in 1944 was returning from Germany with his ammunition exhausted when he spotted two other P-51's being threatened by four ME-109's. Courageously bluffing with his empty guns, he roared down on the four German fighters and broke up their formation, only to see the two P-51's streak for England and safety. When he finally got back to base after a desperate game of shadow boxing with the ME-109's he discovered why the other P-51's had left him in the lurch. They too were out of ammunition!

With two books so similar in subject matter and published so close together, comparison is inevitable. For the professional airman Captain Gurney's *Five Down and Glory* must get the nod on almost every count. As a history it covers the entire story of the air ace and contains more useful factual information. Further, and as too many military histories fail to do, it interprets and draws conclusions from its raw material. There are worthwhile comments on the command of fighter units and the devising of fighter tactics. It is a much better integrated book than *American Aces,* and yet offers more varied and scarcely less exciting fare. After one has read several of the individual stories in *American Aces,* the repetition of the framework begins to tell. Each reads well in itself, but twelve times is too much. The introductory history that preceded each of the twelve incidents is rather thin, and although the author is obviously a pilot himself, he does not seem as able to convey the sense of perspective that Captain Gurney does.

Both books point up the essential moral about the fighter ace; he is intensely alert, he knows and uses tactics, but most of all, he is the relentless attacker. Always the hunter, he forces his opponent to become the hunted one. For the student of air warfare, this is perhaps the most broadly applicable lesson of all.

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LOW LEVEL MISSION; THE STORY OF THE PLOESTI RAIDS, by Leon Wolff, Garden City, N. Y.: Doubleday and Company, Inc., 1957, $4.50.

On August 1, 1943 Mediterranean-based heavy bombers flew one of the greatest air missions ever carried out in any war: the low-level B-24 attack on the Ploesti oil refineries in Rumania. The mission was the first large-scale, minimum-altitude attack by Army Air Forces heavy bombers upon a strongly defended target. It was the longest major bombing mission, in terms of distance from take-off base to target, flown up to that time. As an example of brilliant conception, careful preparation, thorough preliminary practice, and, above all, of heroism during execution (five participants were awarded the Medal of Honor — the largest number from a single operation in American history —), the operation probably has no equal.

Ploesti was a particularly inviting target, for, it was estimated, close to one-third of Germany's total supply of liquid fuel came from there. The Russians had attempted without success to bomb the fields several times in the summer of 1941 and in September 1942. A dozen B-24's of the so-called Halverson Mission had made a hurried strike at the refineries in June 1942, but weather had so interfered that the mission had accomplished nothing. The raid of August 1 was designed to be a big affair that would knock out the entire Ploesti complex.

There are always a number of contributors to any major operation, but it appears that the principal contributors to the development of the Ploesti plan were General H. H. Arnold, Brig. Gen. O. A. Anderson, Col. Jacob E. Smart, and Lt. Col. C. V. Whitney. Maj. Gen. Lewis H. Brereton, Commander of the Ninth Air Force, was charged with carrying out the operation. It was he who made the final decision to take off from bases around Benghazi, Libya, and to attack at minimum altitude. And it was under his direction that the detailed plans for the operation were worked out and the training conducted.

Training was thorough and realistic, including practice bombing of a scale model of Ploesti, constructed in the desert. Crews memorized vast quantities of data dealing with the route to be flown, enemy defenses, the targets, and dozens of other critical items. Actually, the training at Benghazi was simply the final phase, for of the five groups (the 44th, 93d, 98th, 376th, and 389th) all but one (the 389th) had long been in combat.

Shortly after dawn on August 1 the 177 planes, carrying 1,725 Americans and 1 Englishman, under the command of Brig. Gen. Uzal G. Ent, took off. All went rather well, despite a few early aborts, until the formation was over Bulgaria where towering cumulus clouds destroyed its unity. This in itself was not too serious; what was serious was that shortly before reaching Ploesti the commander of the lead group, the 376th, mistook the town of Targoviste for the town of Floresti (the final checkpoint) and turned southeast too soon. The 376th, followed by the 93d, was at the outskirts of Bucharest before it realized its mistake, and then it was too late, for Bucharest was the headquarters of Rumanian defenses which promptly went into action.

The two groups turned back toward Ploesti, only to run into a terriffic AA barrage and heavy small-arms fire, as did the 44th and 98th who came in from the north as scheduled. (The 389th was hitting refineries at nearby Campina.) Organization and air discipline, of necessity, went out of the window. The carefully planned avenues of attack could not be followed; bombardiers hit the best targets that showed

up. Flak, ground fire, balloon cables, a dense pall of smoke, flames from burning oil tanks, half-hidden smokestacks, and the explosions of delayed-action bombs made Ploesti a Hell for the planes, which were attacking at tree-top level. Most of the pilots would have been justified in abandoning the mission, but, without exception, they carried through. Some damaged bombers were deliberately flown into the targets.

On the withdrawal enemy planes of every kind from ME-109's to old biplanes jumped the bombers, keeping up a running fight until the Liberators were over the Adriatic. The bombers landed all over the Mediterranean, the final count showing that 92 reached Benghazi, 19 landed at other friendly fields, and seven landed in Turkey.

Losses were heavy: fifty-four planes were lost, forty-one of them in action; worse by far, more than 500 airmen were dead, missing, prisoners, or interned. And, despite the severe damage inflicted on the refineries, Nazi labor quickly put Ploesti back in operation. Too, the Nazis built up their air defenses around the fields, which made all the tougher the Fifteenth Air Force's campaign in the spring and summer of 1944 (at high altitude and with fighter escort) which finally knocked out the Ploesti complex.

Low Level Mission: The Story of the Ploesti Raids tells the story of the AAF's long war against Ploesti, especially the magnificent epic of August 1, 1943. It is a good book, well-written and exciting; the chapters on the August 1 raid are full of drama and human interest. It is based upon some sound research and interviews with a number of the participants. And it tells a story which, except for necessarily brief coverage in Volumes II and III of *The Army Air Forces in World War II* and a few magazine articles, had not been told—but needed to be because the Ploesti Raid was one of the outstanding events in the history of our air arm.

Low Level Mission is by no means one-hundred percent satisfactory. For one thing the author devotes two long chapters, a fourth of the book, to a discussion of air power from World War I to 1943 — the chapters are quite unnecessary to the Ploesti story. For another thing, the final chapter, which covers the many raids of 1944, is too short. Thirdly, the author shows a certain amount of prejudice for or against some of the key figures and there is a bit too much editorializing and moralizing; the result is a lack of objectivity.

Perhaps the best way to summarize *Low Level Mission* is to say that it is well worth reading, but that a really great story of a truly great mission has not yet been written.

A.F.S.

THE DAMNED WEAR WINGS, by David M. Camerer, Garden City, New York: Doubleday and Co., Inc., 1958, $3.95.

Out of the early morning blackness the bomber crewmen file into the briefing hut and move stolidly to their places, scraping the benches and crates against the floor as they settle into their seats. A quiet comes over the hut as the cover is pulled back from the large briefing map that fills the wall at the front of the room. Then a harsh swell of murmurs sweeps through the group, but quickly ebbs away, and the mission briefing begins.

In every heavy bomber group in the European Theater in World War II, this severely discontented reaction of the crews was invariably the same at the moment of being confronted with a mission against a target heavily defended by flak. It was an intense feeling, shared by all who flew the missions, and born of the knowledge that the planes had to be flown absolutely straight and level on the bomb run during the time of maximum exposure to the flak guns. The personal defense adopted by most combat airmen was to close off their minds to this danger, which they could do nothing about anyway, and maintain either a stoic fortitude or a happy-go-lucky optimism that usually cloaked a feeling of fatalism.

It is this theme that David Camerer has developed in *The Damned Wear Wings*. His novel is the story of a B-24 Liberator Bomb Group in the 15th Air Force based

in southern Italy during the last year of World War II, operating against German-held targets in the Balkans and Southern Europe.

More particularly it is the story of what happens to the men of this B-24 Group as they go back again and again to bomb from high level the heavily defended oil refineries around Ploesti in Rumania.

The Commander of this Group is Col. Mark Royson, a West Pointer and Command Pilot. Under the stress of the first mission to Ploesti he loses his nerve and blunders, causing two of his own crews to collide in mid-air. Given the chance to redeem himself, Royson triumphs over his fears and regains the respect of his men.

The real symbol of leadership in the Group is Capt. Mike Sawyer, a tough, fear-nothing, rugged, ex-professional football star. Sawyer holds the Group together by his courage and by his support of Col. Royson. During lulls between missions he carries on a torrid romance with an excitingly beautiful and primitive Italian girl named Zoe. In the final test of his courage and dedication to the Group's mission Sawyer chooses duty over his passion and love for Zoe.

The author has told an absorbing story in an interesting way and in the process has captured the authentic flavor of life in a heavy bomber group in World War II. The characters he portrays: the skilled, experienced old crew chief, the young intelligence officer who feels compelled to fly just one tough mission, the nervy, irreverent, unknowledgeable gunners, are all true to type.

The writing is rough in places, sometimes too staccato in style, but nevertheless strong and compelling. Once you start this book you will want to read it right through to the end.

R. D. P., Jr.

Recent Books

Babington-Smith, Constance, *Air Spy*, New York: Harpers, 1957, $4.00. Excellent personal account of photoreconnaissance in WW II.

Bruce, J. M., *British Aeroplanes*, 1914-1918, London: Putnam, 1957, $35.28.

Everest, Lt. Col. Frank K., *The Fastest Man Alive*, New York: E. P. Dutton and Co., 1958.

Fedden, Sir Roy, *Britain's Air Survival: An Appraisement and Strategy for Success*, London: Cassell, 1957, $1.61.

Fitzgibbon, Constantine, *Winter of Bombs*, New York: W. W. Norton, 1957, $3.95. Account of the Battle of Britain and the London Blitz.

Giovannitti, Len, *The Prisoners of Combine D*, New York: H. Holt, 1957, $5.00. Novel on Stalag Luft III by a former German POW.

Howe, George F., *Northwest Africa: Seizing the Initiative in the West*, Washington: Department of the Army, 1957, $7.75. Covers Operation Torch and the victory in North Africa.

Humphries, John, *Rockets and Guided Missiles*, 2d Ed., New York: MacMillan, 1957, $6.00.

Larkins, William T., *The Ford Story*, Wichita: William Longo Publication, 1958, $4.95. A pictorial history of the Ford tri-motor from 1927-57.

Mandrake, Charles G., *The Gee Bee Story*, Witchita: William Longo Publication, 1958, $4.95. The complete story of the Gee Bee series of planes.

Miller, Ed Mack, *Tales of a Flier's Faith*, New York: Doubleday and Company, 1958, $3.95.

Payne, Air Comdr. L. G. S., *Air Dates*, New York: F. Praeger, 1957, $7.50. British Chronology from 1783 to 1957.

Witkin, Richard, *The Challenge of the Sputniks*, New York: Doubleday and Company, 1958, $1.50. A collection of a series of articles and speeches on satellites.

Recent Articles

"American Armament: Guided Missiles," *Ordnance*, Sept-Oct 1957. Excellent folding chart on all known U. S. missiles.

"Atomic War and Partisans," *Military Review*, June 1957.

Berkner, Lloyd V., "Earth Satellites and Foreign Policy," *Foreign Affairs*, January 1958.

Clifton, Paul, "Billy Bishop V. C.," *RAF Flying*, December 1957.

deSeversky, Major Alexandar P., "Our Current Inferiority Is Not Scientific," *Vital Speeches*, February 1, 1950.

deSeversky, Major Alexander P., "So That This Nation Shall Not Perish," *Pageant*, March 1950.

Dinerstein, Herbert S., "The Revolution in Soviet Strategic Thinking," *Foreign Affairs*, January 1958.

Garthoff, Raymond L., "Soviet Views on Limited War," *Military Review*, December 1957.

Garthoff, Raymond L., "How the Soviets Organize Their Air Power," *Air Force*, February 1958.

"How Many U. S. Sputniks Coming?" *U. S. News and World Report*, February 7, 1958.

Jacobs, Paul, "Pilots, Missilemen, and Robots," *The Reporter*, February 6, 1958.

Karten, Dave, "Twilight for the Peacemaker," *Airmen*, November 1957. Prelude of the requiem for the B-36.

"Man in Space," *Newsweek*, February 3, 1958.

McCorkle, Brig. Gen. Charles M., "Command and Control of Ballistic Missiles," *Airmen*, December 1958.

"New Pattern for the Pentagon? The Rockefeller Study Report," *Air Force*, February 1958.

O'Ballance, Major E. O., "The Israeli Campaign in the Sinai, 1956," *Army Quarterly*, (London), April 1957.

Orem, Vice Admiral Howard E., "Shall We Junk the Joint Chiefs of Staff," *U. S. Naval Institute Proceedings*, February 1958.

Schriever, Major Gen. Bernard A., "Some Hard Facts for a Harder Future," *Air Force*, February 1958. Excerpts from testimony before Congressional Committees.

Teller, Edward, "Alternatives for Security," *Foreign Affairs*, January 1958.

White, General Thomas D., "USAF Doctrine and National Policy," *Air Force*, January 1958.

"Why Soviets Plan 'First Blow' — What Missiles Mean in Red Strategy," *U. S. News and World Report*, February 7, 1958.

"U. S. First to Put a Man in Space," *U. S. News and World Report*, January 17, 1958. An interview with Capt. Iven C. Kinchelow, Air Force Pilot of the X-2 and X-15.

Zaehringer, Alfred J., "Missiles of the USSR," *Ordnance*, Jan-Feb 1958.

NEWS ITEMS

Memorial Fund

THE AIR FORCE HISTORICAL FOUNDATION wishes to announce that Dr. and Mrs. Lauren C. Post of San Diego, California, have become the first members to contribute to THE AIR FORCE HISTORICAL FOUNDATION Memorial Fund. Dr. and Mrs. Post have contributed $25.00 in honor of their nephew Capt. Leo Fred (Ted) Post, Jr., who was killed in the line of duty at Edwards Air Force Base, California, on February 24, 1958.

Readers are reminded that such contributions to THE FOUNDATION are deductible for income tax purposes, and that we welcome further contributions of this nature.

The Rising Tide?

At this writing it can be reported that the membership rolls of THE AIR FORCE HISTORICAL FOUNDATION are rising at a steady rate, but not at an encouraging rate. In fact the rate of growth has been far less than the "founding fathers" and the Board of Trustees had hoped it would be. During the past year, we have for the first time gotten subscriptions from among several post libraries, university libraries and city libraries, as well as from each of the ROTC units in the various colleges and universities throughout the country. Several places and organizations where the realm of ideas, history, and education can be considered to be the primary mission, have evidenced surprisingly little interest in *The Air Power Historian.* What gives?

One of the better trends in the past few months has been the addition of new names on the life membership rosters. Names already on this list include:

Life

Claire L. Chennault
Harold L. George
Frank P. Lahm
Howard E. Payne, Jr.
James L. Riley
E. V. Rickenbacker
Edward Tinker
William A. M. Burden
Eugene E. Wilson
Paul Weissman
Charles F. McElwain
Harry T. Gallaher
Charles A. Lindbergh

Contributing Life

William M. Allen
Frederick C. Crawford
Edward P. Curtis
James H. Douglas
Frederick M. Hopkins, Jr.
Croil Hunter
C. C. Moseley
Robert Proctor
G. G. Hughes

Patron Life

Frederick L. Anderson
J. H. Kindelberger
David M. Schlatter
L. J. Sverdrup
Barney McK Giles
Wm. S. Johnston
Robert A. Lovett
Erik H. Nelson
Albert Weatherhead
John Hay Whitney
Jerome Taishoff

Benefactor Life

C. V. Whitney

Human Factors in Space Flight on TV

According to *Air Force Magazine* for February, a special series of thirteen half-hour programs was filmed at the University of Houston under the guidance of the Air University's USAF School of Aviation Medicine at Randolph AFB, Texas. Entitled "Doctors in Space," the programs are moni-

tored by Dr. Hubertus Strughold of SAM and Prof. John Rider of the University of Houston. Each program features guest appearances including Maj. Gen. Bernard A. Schriever (C/G WADC), Major David G. Simons (who ascended to above 19 miles in a balloon), Captain Iven C. Kincheloe, Jr., Dr. Albert G. Wilson (astronomer), and Krafft A. Ehricke (rocket designer for Convair). The entire project was financed by the Ford Foundation while the scripts were prepared by Gordon Peyton of SAM.

Many readers of *The Air Power Historian* may recall that the President of Houston University is Clanton W. Williams, former Chief Historian of the Army Air Forces during World War II and Director of the Air War College Studies, (1950-1954).

Airpower Book Club Progress

Reports reaching this office indicate that memberships in the *Airpower Book Club* sponsored by the Air Force Association are flowing in at a good rate. The financial benefits of the Book Club seem persuasive. For those interested, annual subscriptions of $15.00 in the Airpower Book Club can be directed to the Air Force Association, Mills Building, Washington 6, D. C. This subscription brings a guaranteed minimum of $25.00 worth of the best books on airpower.

Those who already are members have received the first selection, Isaac Don Levine's *Mitchell: Pioneer of Air Power*, plus the bonus volume, *The History of the U. S. Air Force*, edited by Al Goldberg. As we go to press, we have been informed that the second selection of the *Airpower Book Club* will be: *United States Air Force Report on Ballistic Missiles: Its Technology, Logistics and Strategy*, published by Doubleday and Co., New York, N. Y.

New members may have their choice of either the Mitchell book or the book on missiles.

LETTERS TO EDITOR . . .

OOPS, WE GOOFED

Dear Sir:

. . . I . . . bring to your attention an error in an article entitled "New Jet Records" in the January 1958 issue.

In it you mention that Tactical Air Command's flight of three B-66's nonstop from George Air Force Base, California to Manila took place a week after General Curtis LeMay's record flight to Argentina in a KC-135. Actually they both took off on the same day, November 11th, to be exact . . .

Sincerely,

HAROLD A. SUSSKIND
Major USAF
Shaw Air Force Base, S. C.

Dear Sir:

Please accept my sincere thanks for the January issue of your very fine publication, *"The Air Power Historian"*; it is most interesting and constructive reading.

. . . commend him (Col. McCann) for his article "The Ugly Duckling of Air Power." It brought back many memories of our "shoe string operations" in CBI.

Sincerely,

CHARLES D. FARR
Col. USAFR
Bossier City, La.

(EDITOR'S NOTE: Unfortunately the articles and histories of organizations, units, personnel, etc., do not generate themselves. They must be told by someone. Are there any offerings?)

NOTICE TO MEMBERS

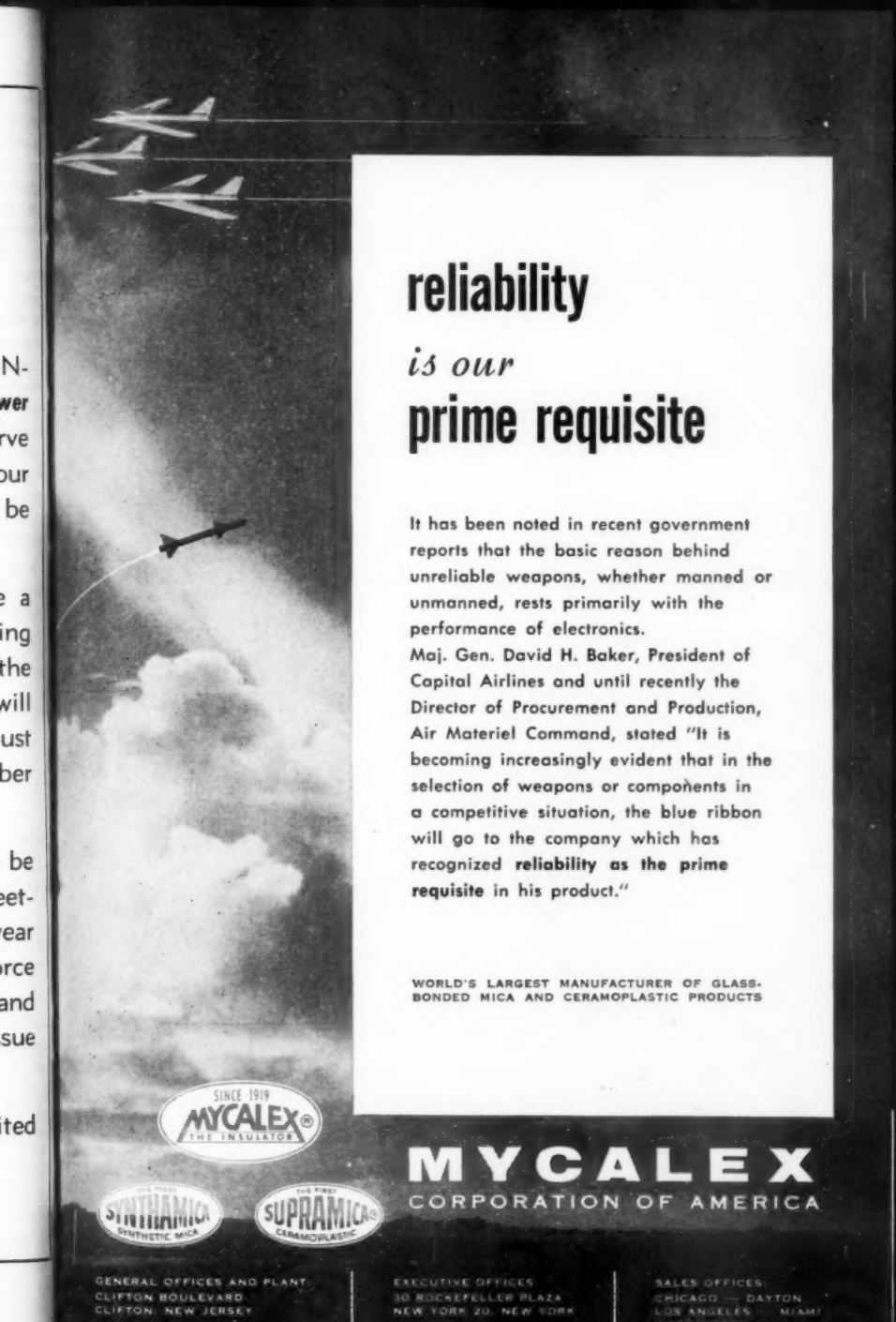
BALLOTING FOR TRUSTEES AND ANNUAL MEETING

Members of THE AIR FORCE HISTORICAL FOUNDATION will find attached in this issue of ***The Air Power Historian*** a ballot for the election of six members to serve as Members of the Board of Trustees, for a term of four years. The card, as a convenience, needs only to be checked and mailed.

This year, as in every other year, except where a vacancy occurs by death or resignation, we are electing six members. In accordance with the regulations of the constitution twelve names are listed from which six will be selected. All voting is done by ballots which must be mailed to the Executive Director before 1 September 1958.

The ballots will be tabulated and all figures will be presented for acceptance to the Board at the Annual Meeting of THE FOUNDATION, which, once again this year will be held in Washington, D. C., at Bolling Air Force Base, sometime early in September. The exact date and place of meeting will be given all members in the July issue of ***The Air Power Historian.***

Members are reminded once again that all are invited to attend the Annual Meeting.



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It has been noted in recent government reports that the basic reason behind unreliable weapons, whether manned or unmanned, rests primarily with the performance of electronics.
Maj. Gen. David H. Baker, President of Capital Airlines and until recently the Director of Procurement and Production, Air Materiel Command, stated "It is becoming increasingly evident that in the selection of weapons or components in a competitive situation, the blue ribbon will go to the company which has recognized **reliability as the prime requisite** in his product."

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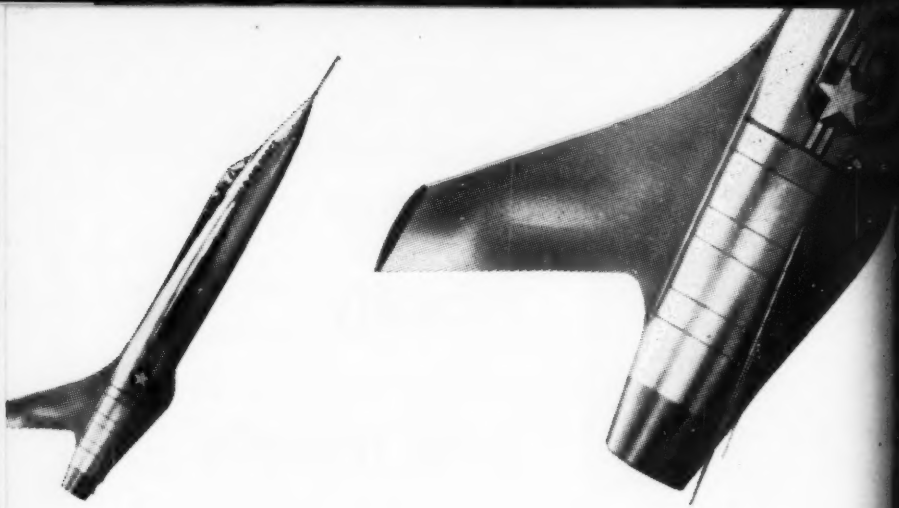

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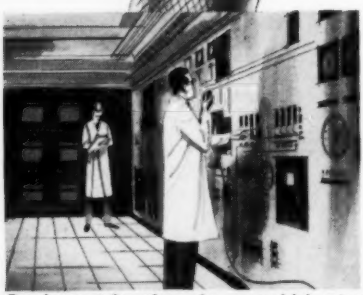

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